

Contractors and Engineers Monthly

Vol. 44, No. 12

DECEMBER, 1947

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Covering the Field

Railroad Relocation

Grading, tunnel work, and concrete bridge substructures are part of the RR-relocation job described on this page.

Battle Against Snow

Better highway alignment can cut snow-removal and other maintenance costs, according to a story on the first page.

Big Rock Breakwater

Careful pre-construction work helps lick rock-handling details for a 1,000-foot breakwater extension (page 2).

Earth-Concrete Dam

A concrete spillway flanked by earth embankments comprise the dam whose construction story is featured on page 6.

Aerial-Photo Surveys

Aerial strip photos of pavement performance can implement highway research, the article on page 9 points out.

New Concrete Road

Concrete laid on two outer lanes will make way for an inner asphalt surface on a new 4-lane highway. Turn to page 17.

Bituminous Paving

Cold weather hampered but didn't stop a plant-mix widening and surfacing job. The story is on page 23 of this issue.

Chain of Rocks Project

Six companies combine to build Locks No. 27 with an adjoining canal in the Mississippi near St. Louis (page 27).

Highway Maintenance

Colored reflectorized route markers are being used in Texas. See page 29. As told on page 72, asphalt undersealing precedes a plant-mix surfacing job.

Grading for Airport

Good weather and a fast fleet pushed the Austin Straubel Field grading job out ahead of schedule, despite mud (page 32).

Roadside Seeding Job

Page 35 tells how a roadside contractor ded and mulched a mile a day on a 1-order job for a dirt contractor.

Road-Base Stabilization

A sand-clay base is stabilized with slag and given a double bituminous surface treatment for 9.9 miles. See page 43.

County Road Work

A 50-mile annual schedule of new roads is the goal of one alert county. For the start it has made, read page 49.

Concrete Flood Wall

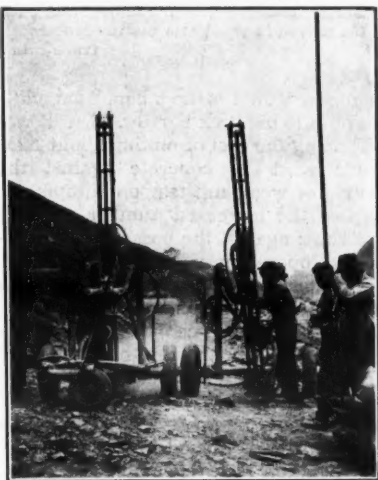
A 2,800-foot-long concrete wall built on sheet piles now protects Memphis from floods. Page 54 tells how it was built.

Bridge Construction

Three times jinxed by floods, a contractor nevertheless completes a concrete-girder bridge. Page 66.

Million-Yard Grading Job

Gouging a new dual-lane roadbed through mountains called for tough digging in dirt and rock. The account is on page 84. (You will find "In This Issue" on page 4)



C. & E. M. Photo

At Bow Ridge rock cut, these two Ingersoll-Rand air compressors shown in the background put down drill holes on an average of 6-foot centers.

Better Alignment Eases Snow Fight

State Highway Division Gets Rid of Curves and Saves Money on Its Snow Battle Each Winter

♦ OUT in Miles City, Montana—the last real frontier town in the western cow country—men are still demonstrating that the straightest trail is the one that pays. For by working towards better highway alignment, with tangents where possible, they are able to show a saving in maintenance costs, particularly in the matter of removing snow from the roads.

In the roaring eighties, Miles City was the northernmost terminus of the famed Texas Trail. Only recently, Division Engineer S. B. Sanders of the Montana State Highway Commission in Division 8 retired from the highway service one of the rugged old XIT riders at the age of 75.

(Continued on page 15)

Railroad Relocated For Reservoir Project

By WILLIAM H. QUIRK,
Eastern Editor

♦ ALTHOUGH the pioneer days of railroad construction in this country may be well in the past, what those early builders were up against is being demonstrated in the mountains of western Pennsylvania. A new double-track line, 16.1 miles long, is now being constructed to replace a stretch of the Pennsylvania railroad which lies in the area designated as the site for the Conemaugh River Reservoir. For work on the flood-control concrete dam cannot begin until the railroad is relocated.

The relocation got under way in April, 1946, and is scheduled for completion by the middle of 1948. Salient features of the \$7,000,000 project are the heavy grading, totaling over 4,000,000 cubic yards of earth and rock; the building of concrete substructures for six major bridges; and the boring of a double-track 2,660-foot tunnel to be lined with concrete.

The flood-control project is part of the Corps of Engineers' program to reduce flood dangers along the Allegheny River which, with the Monongahela, becomes the Ohio River at the apex of Pittsburgh's Golden Triangle. Responsible for the famous Johnstown flood, the Conemaugh River eventually joins the Allegheny at Freeport, Pa., about 32 miles above Pittsburgh. This 16.1-mile relocation on the Pennsylvania Railroad's Conemaugh Division begins at Blairsville and extends west and north to Avonmore; it touches on Westmoreland, Indiana, and Armstrong Counties. The double-track line is the main freight line between New York and the west for the Pennsylvania Railroad; it serves St. Louis, etc., as well as Chicago.

In the Corps of Engineers' proposal the 16.1-mile project was divided into four units for separate bidding. Three of the contracts, or units 1, 2, and 4, were awarded to the same group of contractors: the Hunkin-Conkey Con-

Heavy Grading, Six Major Bridges, and Tunnel Are Included in 16.1 Miles Of Double-Track Line

struction Co. and Shofner, Gordon & Hinman, of Cleveland, Ohio, and Los Angeles, Calif., on a total low bid of \$4,846,000. The length of these sections, which begin at the east end of the project, are 5.0, 4.4, and 5.2 miles respectively. Unit 3, although only 1.5 miles long, includes the tunnel near Saltsburg and was awarded to Herman Holmes of Crystal Falls, Mich., on a \$2,216,000 bid.

Two other contracts pertinent to the project will be let at a future date. One will include the fabrication and erection of the steel superstructure for the six bridges, while the other will cover the trackwork for the railroad. The latter will involve the placing of ballast, ties, and rails. A contract for the dam itself is expected to be awarded sometime early in 1948.

Concrete Bridge Substructures

The old bridges, which the new line is replacing, were built towards the end of the last century and are still in a good state of repair. They are either stone-masonry arches or masonry piers with steel truss spans. The new bridges have reinforced-concrete piers and abutments and will be spanned by either plate girders or trusses.

Social Hall bridge is the farthest east of the new structures. It crosses the Conemaugh River about 1½ miles from Blairsville on piers up to 100 feet high. It has eight spans totaling 824 feet in length and will have a plate-girder superstructure. At this point the new and the old bridges are only about 1,000 feet apart.

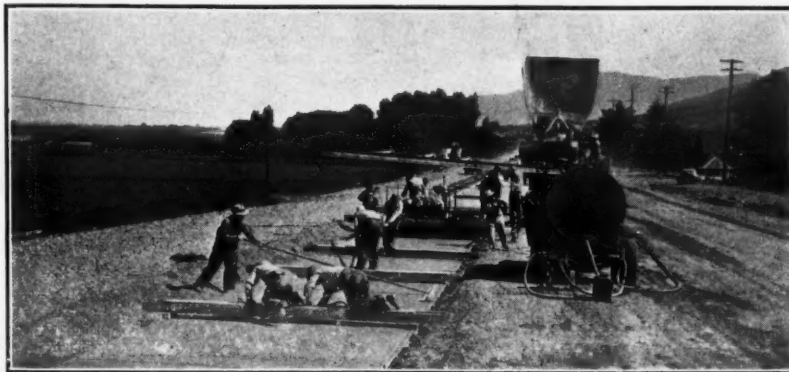
The new alignment never does get very far from the existing railroad: at the Bow Ridge crossing of the Conemaugh the two bridges actually intersect, the new passing over the old. There the old stone arches give way to piers over 100 feet high which will carry six spans totaling 900 feet, made up of lattice deck trusses with plate-girder approaches. The bridge crosses the river on a 20-degree skew.

The remaining four bridges are Spruce Run with four plate-girder spans totaling 365 feet; a 3-span plate-girder bridge 260 feet long over Blackleg Creek; Long Run, with a plate-girder span of 75 feet supported on two abutments; and a 461-foot through truss having three spans crossing Kiskiminetas River.

For the concrete work a large batch plant was set up on a siding of the Pennsylvania Railroad at Tunnelton, about the center of the project. Actually three tracks were built into the Noble batch plant: two tracks on one side of the plant for aggregate cars,

(Continued on page 60)

CONCRETE PAVING ON COMBINATION 4-LANE ROUTE



C. & E. M. Photo

A general shot from the finished end of Clyde & Co.'s concrete-paving operations shows finishers at work from their bridges, joints being dressed, and the company's Multi-Footer 27-E paver in the background. The story is on page 17 of this issue.

Rock-Handling Details Licked On Big Breakwater Contract

Rock Quarried Near-By Is Hauled Over Special Road; Placed by Heavy Equipment; Blasts Clear Harbor Bottom

By **RAYMOND P. DAY**,
Western Editor

♦ A DARING 75,000-ton coyote blast, construction of a 2,900-foot concrete haul highway at the contractor's expense, and the stockpiling of 100,000 tons of heavy slope rock prior to the start of any pay item: these constituted expensive but practical insurance that a big new breakwater extension in the open North Pacific Ocean would be finished on time.

With that preliminary work finished, the job was geared to a daily production of 4,000 tons per day.

Basalt Rock Co., Inc., of Napa, Calif., built the big new 1,000-foot rubble extension at Crescent City in California, near the Oregon state line, for the San Francisco District Office of the Corps of Engineers. The \$841,500 contract was started April 15. It was scheduled to be finished by the first of October, ahead of very heavy swells which batter the rugged rock coast. The job included quarrying and placing all rubble masonry, and some special underwater demolition in the harbor.

In the early days, the California coast at Crescent City was a whaling station. Small ships took refuge behind a big jutting rock in the half-moon bay. Now, however, Crescent City's economy includes fishing and lumber. The breakwater extension will serve these industries by making the harbor a little safer for the fishing fleet during storms. Then later, if the harbor is deepened and the rich 9,000,000,000 board-foot stand of redwood lumber is tapped, the breakwater will be there to safeguard lumber-cargo vessels.

The North Pacific Ocean at Crescent City is vicious. Brisk northwest winds in summer can start moderate seas to rolling. Storms from the south, in winter, turn the ocean to green and white fury, with heavy combers lashing the ill-protected coastline. The mean tidal range is 6.9 feet, with extreme fluctuations which range between minus 2.5 and plus 9.8, referred to mean lower low water.

The careful, play-it-safe preparations in advance of actual construction enabled the work to proceed rapidly out on the exposed water. It is a policy of Basalt Rock Co. to proceed with things this way: a policy gained from

many years of experience in waterfront work on this tricky ocean.

Breakwater Is Heavy

The design of the Crescent City breakwater is considerably heavier, according to General Superintendent E. L. "Ernie" Ilsley, than that of similar harbor protective works farther south. Built in 35 feet of water across a rocky harbor bottom, the Basalt job adds another 1,000 feet to the existing 2,900-foot structure. Later, the Corps of Engineers may extend it another 1,700 feet to Round Rock, a big natural rock formation which juts up from the ocean floor.

The breakwater is 20 feet wide on top, with 1 1/4 to 1 side slopes on the inner side, and 1 1/2 to 1 slopes on the outer or seaward side. Top elevation is 15 feet above mean lower low water. It was built with a center core of rock up to 4 tons in size, and faced with 5-ton stone. Interlocking pieces of rock in sizes up to 15 tons form the 10-foot-thick blanket of cap rock.

The Corps of Engineers made estimates, and figured that the completed



C. & E. M. Photo

For concrete haul-road construction on its Crescent City breakwater job, Basalt Rock Co. moved in this little Cletrac HG tractor carrying an Ateco front-end scoop to charge truck-mixers with cement.

company would make a beneficial addition to the big rock barrier. But it was balancing the cost of mixing about 1,250 cubic yards of concrete against the saving of wear and tear on equipment; against the increased number of loads per shift; against the possibility of continued operation right after a storm. To the company executives it seemed a justifiable proposition.

Permanente bag cement and stream-run gravel from the Smith River were brought in, and a mix set up for 5 sacks to the cubic yard. A little Cletrac HG tractor, carrying an Ateco L-HG front-end scoop, was moved in to charge the truck-mixers with cement and rock. Three Dodge-mounted Jaeger Dual-

water, at Preston Island, Basalt opened up an old county-owned quarry. Preston Island is a huge jutting promontory of white Franciscan lime rock, connected to the mainland by a narrow neck of land.

Here again extensive preliminary work paid off nicely. A 52-foot coyote tunnel, bored straight into the base of Preston Island, was connected to two laterals, one 75 feet long and one 62 feet long. This tunnel maze was then loaded with a nominal charge of only 12 tons of 20 per cent Trojan bag powder. When the shot was pulled, with Primacord detonating fuse, 75,000 tons of heavy rock, much of it usable, tumbled down to the base of Preston Island.

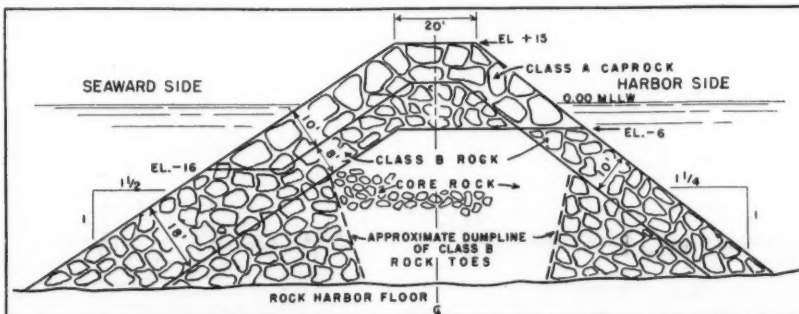
Extensive secondary drilling was constantly in progress, however, with an Ingersoll-Rand and a Gardner Denver wagon drill and a dozen jackhammers in use. Four 315-cfm compressors, two Ingersoll-Rands and two Gardner-Denvers, furnished the power for drills. The jackhammers took their air directly from the compressors through flexible hose, and extensive steel air headers were not needed.

Detachable rock bits were used by the wagon drills, but the jackhammers used Ingersoll-Rand steel with shaped rock bits. The rock was hard and brittle, and tough to drill. Drillers generally sank about two holes with a piece of steel and threw the drill over to the discard pile, where it was picked up and sent over to the blacksmith shop to be re-sharpened. This quarry blacksmith shop was equipped with a Type 33 Ingersoll-Rand drill sharpener, with an Ingersoll-Rand furnace and power punch. The steel was quenched in water after the bit was re-shaped.

All secondary shooting was done by Hercules stick gelatin, 60 per cent strength, set off with fuses.

Two Northwest Model 80 shovels with Esco dippers were brought in along with a Northwest Model 70 to handle stone. With the quarry in operation by the early part of May, about 100,000 tons of Class A and B debris

(Continued on page 78)



The new Crescent City breakwater looks like this in cross section. It required 57,900 tons of Class A rock, 81,900 tons of Class B, and 120,500 tons of core rock.

breakwater weighs one ton per 16 cubic feet of finished structure.

Basalt Concretes Haul Road

Because of rough water which rakes up over the top of the structure during storms, Basalt Rock Co. was in something of a spot. Any ordinary haul road it might build for its Euclid fleet would promptly wash away in a storm, and would have to be replaced. Besides, an ordinary haul road would slow the big trucks down.

The company asked for Army permission to build a 12-foot concrete highway, at the contractor's expense, out across the top of the 2,900-foot existing jetty. This permission was granted. Certainly by sealing the top of the old jetty with thick concrete the

Mix truck-mixers were used to mix and haul the concrete out to the job.

Concrete was mixed to about a 3-inch slump, then hauled out and spread 6 inches thick on the first 2,000 feet of the old jetty. This portion already had some concrete topping on it, with ties for a railroad track. The outer 900 feet of virgin rock, badly scoured of fines, was covered with a concrete blanket 12 inches thick.

Concrete was spread out with a timber screed and given a rough finish. It made an excellent, high-speed haul road, which gave good service under 15-ton loads carried by end-dump Euclids.

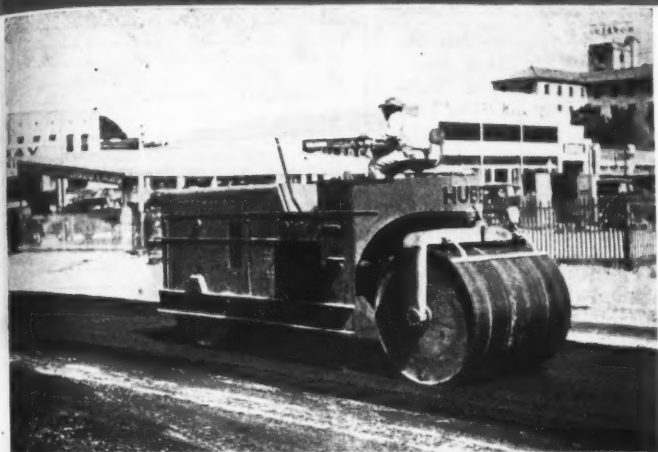
Big Quarry Is Opened

Two miles northwest of the break-



C. & E. M. Photos

From the transfer ramp, another of Basalt Co.'s pre-construction activities, a Euclid dumps breakwater core stone into one of two 750-cubic-yard bottom-dump scows (left). At right, a loaded barge starts out, under tow, to the end of the breakwater.



Corpus Christi paves

with resilient, heavy-duty
Texaco Asphalt construction

Approximately 35 miles of new paving has been laid on streets of Corpus Christi, Texas, this year and last. Hot plant-mixed asphalt construction was used exclusively by the city in carrying out this outstanding paving program.

For the most part, Corpus Christi's plans called for resurfacing old, worn streets with a new, easy-riding asphalt wearing surface. Some thoroughfares, however, required a base as well as a surface. Plant-mixed asphalt construction was specified for both base and surface on such streets, providing a six-inch thickness of durable, shock-absorbing asphalt pavement.

A Texaco Asphalt product of 85-100 penetration was employed by Brown & Root, Inc., of Houston and J. M. Dellinger, Inc., of Corpus Christi, the contractors who shared this important municipal paving project. Refined from carefully selected crudes for more than 40 years, Texaco Asphalt products have won the confidence of road builders throughout the United States and abroad.

If you have a street, highway or airport paving problem, why not discuss it with a Texaco representative who is an Asphalt specialist? You will find his experience helpful. Write to our nearest office.



Thirty blocks of wide, busy Leopard Street in Corpus Christi were resurfaced with plant-mixed Texaco Asphalt paving.



Both the foundation and surface of this Lipan Street pavement are of Texaco Asphalt construction.



Corpus Christi used 6 1/2 inches of Texaco Asphalt construction in this 5-year-old North Brownlee Boulevard pavement.

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Engineers Must Show Leadership

That engineers prepare themselves for leadership in national and world affairs was urged upon a group of students by President E. M. Hastings of the American Society of Civil Engineers. He spoke recently at a luncheon meeting of civil-engineering students from southern universities and colleges attending a students' conference during the Fall Meeting of the Society in Jacksonville, Fla. And he pointed out that the engineer is equipped to deal with the world's problems with non-political, unbiased, factual, and analytical thinking.

"Do-gooders, wishful thinkers, and overly nationalistic politicians for much too long have crowded the proponents of common sense almost off the national and international stage", Mr. Hastings said. "Confusion has been added to confusion. Our nation should make our position so strong, so just, and so tempered with realistic gener-

osity that we would gain the respect of the world. Such respect cannot be purchased from foreign nations with dollars."

In warning the embryo engineers against the narrow confines of a purely technical life and technical thinking, he said: "We engineers here in the United States cannot be content to wait for political diplomats to solve the problems; we must put our talents to work and enter whole-heartedly into the tasks of democracy that are now before us. Is it necessary that we wait for power politics, so-called diplomacy, or the might of certain nations to declare themselves for this or that solution before we go to work towards the building of the new and better world for which we so recently fought and for which we made so many sacrifices? I think not. The day is here when the creative mind of the engineer must be used for the revitalization of the world."

Road Builders' Meetings in 1948

For contractors and engineers in the highway field, 1948 will be a "double-feature" year. The American Road Builders' Association is planning two major events—a highway conference in January and the "bigger-and-better-than-ever" Road Show in July. These two gatherings of road builders will serve different purposes; but together they will bring to those attending complete up-to-the-minute information on developments in highway and airport construction procedure, equipment, and materials.

If you have not already made your reservations for the conference next month (January 26-28), don't delay. For at this session, discussions and reports of technical committees will cover a wide variety of subjects—phases of design, methods, equipment, maintenance, and other highway problems. In addition, all of the technical committees will get together, the annual meetings of the ARBA divisions as well as of the Association will be held, the 1948 offi-

cers will be inducted, and the Board of Directors will meet. The Road Builders banquet is scheduled for Tuesday evening, January 27.

With the Christmas season at hand, July, 1948, may seem a long way off. But the dates July 16-24 should be circled in red on your new calendars. Because of the very large attendance expected, those in charge urge that you send in your hotel reservations immediately, if you have not already taken care of it.

This Road Show, the first to be held since 1940, will be the largest assembly of construction equipment ever seen. At the same time, ARBA's 45th annual convention will be held. With over 1,200,000 square feet of space, both outdoors and indoors, at Soldier Field, Chicago, the 1948 Road Show offers the added advantage of providing an opportunity to see many of the new models of construction equipment in action.

So put ARBA's "double feature" on your schedule for 1948.

Safety All Along the Line

Three major points in construction safety were discussed at the National Safety Congress (a report on which appears on page 40). They were: the high cost of accidents; the feasibility of planning for job safety; and the importance of the human factor.

This means that accident prevention must be an objective all along the line. Management must think and plan safety. It must set up a job to avoid potential hazards—to provide safe working conditions. Superintendents and foremen must be constantly on the watch for unsafe practices. Proper training must insure that all the men on the

job know how to work the right—and that always means the safe—way. And most of all, there must be a "climate" favorable to safety—an atmosphere of friendliness and cooperation, concern on the contractor's part for the welfare of his employees; a sense of responsibility in the men for their fellow-workers' welfare.

Is this expecting the millennium? To us, it seems just plain good sense. If you're making up your list of New Year's resolutions, why not head it with the resolve to do your share to improve the construction industry's safety record in 1948?

Labor Act Restores Boss-Worker Balance

Charles M. Upham, Engineer-Director of the American Road Builders' Association, recently discussed the Taft-Hartley Act before the 10th Annual Fall Meeting of the Illinois Road Builders' Association. He discussed it as it applies to road building and held that better understanding of the law would result in improved economic conditions. He urged his listeners to help make the new law thoroughly understood, since it is the public and the nation's economy that suffers from disagreements occurring between labor and management.

Mr. Upham compared the Taft-Hartley Act to the Wagner Act of 1935, which it amends, and pointed out its broader coverage. The former act covered only a few road builders in actual practice; but under the new one, no employer or union is completely outside the jurisdiction of the new National Labor Relations Board.

Mr. Upham cited a poll of employees made recently by a national fact-finding organization. While it is generally supposed that most employees are opposed to the law, a substantial majority of them, union and non-union, were found to be in favor of the law's major provisions, when they were questioned as to specific points. This is something like saying dinner was terrible, although the soup was fine, the entree good, and the dessert really not bad at all.

Workers in general approved these points, in the percentages indicated: requiring unions to submit financial reports, 86 per cent; 60-day cooling-off period, 78 per cent; prohibiting Communist union leaders, 76 per cent; delay of strikes in public-service industries, 78 per cent; and allowing union shop only after a majority vote, 79 per cent.

"The period immediately ahead may be termed critical," said Mr. Upham, "as it is important that labor and management improve their relationship themselves through collective bargaining." The speaker called attention to the fact that the original Wagner Act was passed to remove the disparity of bargaining power between employer and employee. It was intentionally one-sided in favor of the employee. The Taft-Hartley Act, according to its sponsors, is intended to equalize the employer-employee balance. Employers are still subject to the same prohibitions as far as unfair labor practices are concerned. They must still bargain with representatives of the employees' choosing. But under the Taft-Hartley Law, even unions can be found guilty of unfair labor practices.

In concluding, Mr. Upham expressed the hope that this act, with amendments if necessary, would keep the advances labor has made and would bring labor and management into a closer and more understanding relationship which would have a beneficial effect on the country as a whole.

Reclamation Bureau Calls For Engineering Draftsmen

A call has been issued by the Bureau of Reclamation for engineering draftsmen in several optional branches: architectural, cartographic, civil, electrical, mechanical, structural, and general. The Bureau is presently engaged in a large amount of heavy-construction work in the arid sections of the west, and needs draftsmen for that program. All employments will be made in accordance with Civil Service rules. Applications will be received until further notice.

Appointments will be made in Grades SP-6, SP-7, and SP-8, with salaries ranging from \$2,644 to \$3,397 a year. Total drafting experience required for these grades varies from 4 to 5 years, with specialized experience in the op-

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tional branch varying from 9 to 12 months. Specialized experience may be included within the required minimum total drafting experience, or it may be in addition to it. Education in certain cases may be substituted year for year, but will not be accepted under specialized training.

Those interested in these appointments should file Form 57 and Card Form 5001 ABC with the Executive Secretary, Central Board of U. S. Civil Service Examiners, Bureau of Reclamation, Denver Federal Center, Denver, Colo.

Highway-Statistics Booklet

A compilation of highway statistics has been prepared by the Public Roads Administration. It presents historical information of general interest on the subjects of motor fuel, motor vehicles, highway-user taxation, highway finance, and mileage, compiled through 1945.

Most of the statistics in this compilation are carried back over a period of 25 years. With each major division in the book, there is a brief preface of explanation and clarification. It describes the factors that the statisticians took into consideration in preparing the tables and defines the terminology used in the book.

This new bulletin, "Highway Statistics, Summary to 1945", provides background material for the annual series begun with the issuance of the bulletin "Highway Statistics, 1945". Both bulletins are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., and may be obtained directly from that source. "Highway Statistics, Summary to 1945" is priced at 40 cents a copy, and "Highway Statistics, 1945", at 35 cents a copy.



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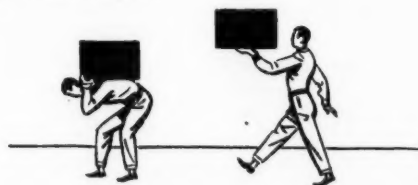
This principle is Ford Bonus Built construction.

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loads beyond the normal call of duty. Ford Trucks are *not* limited to doing one single, specific job!

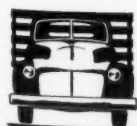
Second, these same WORK RESERVES allow Ford Trucks to relax on the job . . . to do their jobs easier, with less strain and less wear. Thus, Ford Trucks last *longer* because they work *easier*!



The load is carried *EASIER* by the stronger man!

Remember, every one of these great Ford Trucks for '48 is Bonus Built for longer life, wider use. Keep in touch with your Ford Dealer . . . plan to see these new Ford Bonus Built Trucks for '48 as soon as announced. Don't settle for less—get the only truck that's Bonus Built! It's Ford!

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***BONUS:** "Something given in addition to what is usual or strictly due."—Webster's Dictionary

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Earth Dikes Flank Concrete Spillway

Masonry Structure Poured With Buckets and Cranes; Twin 2-Yard Tilt Mixers At Central Batch Plant

DELAWARE Dam, about 4 miles north of Delaware, Ohio, on the Olen-tangy River, is scheduled to be completed by the first of the year. It will contribute its share in averting any such flood as swept through Columbus, Ohio, back in 1913.

The state capital lies 28 miles to the south at the confluence of the Olen-tangy with the Scioto River; it has been vulnerable when these rivers go on a rampage. The new Delaware Reservoir project, constructed under the supervision of the U.S. Army, Corps of Engineers, will harness the Olen-tangy with a dam 18,600 feet long having a maximum height of 94 feet. This length is all earth embankment except a 232-foot concrete spillway and outlet section to pass the normal flow of the river.

Three contracting firms, on a joint venture, were awarded a contract for the construction which, it is estimated, will cost about \$2,600,000. The firms are: Johnson, Drake & Piper, Inc., and S. J. Groves & Sons Co., both of Minneapolis, Minn.; and Bowen & McLaughlin of Phoenix, Ariz. All the earth-embankment work, totaling over 1,000,000 yards, was sublet to J. C. O'Connor & Sons, Inc., of Fort Wayne, Ind. Work got under way in April, 1946, and the project is scheduled for completion this month.

Concrete Spillway

The 232-foot spillway is founded on rock at a minimum elevation of 863, with the top of the five pier sections at elevation 957; thus the structure has a maximum height of 94 feet of concrete. The spillway crest, ogee-type section, is at elevation 922. Between the five piers, which are 8 feet wide, and the abutments, are six Taintor radial-type crest gates. Each is 32 feet long x 25 feet high, and they have a top elevation of 947 when closed. These were set in place by Steel Erectors, Inc., of Newark, N. J. Five sluices, 6½ feet square, run through the spillway section with their flow line at elevation 881.

Across the downstream face of the concrete structure is a stilling-basin concrete slab—232 x 66½ x 5 feet average depth. The top of the slab is at elevation 873. Into the top of the slab are constructed 47 concrete baffles, laid out in two rows. They are 6 feet high, 5 feet wide, and 10 feet long at the bottom x 3½ feet at the top; the downstream faces are on a slope.



C. & E. M. Photo
This concrete batch and mixing plant was purchased by the Delaware Dam contractors from the TVA. It stands 100 feet high, and the upper portion consists of a C. S. Johnson batcher with 600-cubic-yard aggregate bin and a 100-cubic-yard cement bin.

The spillway, is flanked on each side by abutments 298 feet long, 3 feet wide at the top, with a vertical face on the flow sides and a batter of 0.72 to 1 on the land sides. They measure 169 feet 3 inches from the axis of the dam south or downstream, and 128 feet 9 inches north or upstream.

At elevation 947 the reservoir formed by the dam will cover 8,700 acres, and will store 132,000 acre-feet of water. Another function of the project will be the conservation of water for downstream communities which use the Olen-tangy as a source of water supply.

New Riverbed

At the dam site the Olen-tangy flows nearly due south, but the new concrete spillway is not constructed in the original river channel. The work was made easier, and of course more economical, by building the structure along the left bank of the river. A cofferdam about 1,500 feet long was constructed along the edge of the water and bending inward at the extremities. The start of the coffer was with circular sheet-pile cells, 26 feet in diameter. But a shortage of steel forced the contractor to finish it with a combination of



C. & E. M. Photo
On the earth-embankment section of Delaware Dam, a Caterpillar D8 pulls a LeTourneau PP 16-yard Carryall at the left. At right, a Grace dual-drum sheepfoot roller moves over the newly placed fill.

timber cribbing and rolled-earth embankment. Within its protection the east and west abutments and the spillway section were completed in that order.

Two of the seven monoliths in the spillway were left low at this stage so that these openings, together with the five sluices, could take the flow of the river when it was diverted for the second-stage cofferdam. A new channel was then excavated, diverting the flow of the river directly into the spillway section.

In August of this year a second cofferdam was built across the old riverbed stretching from the first cofferdam to the right bank. This was constructed of rolled-earth embankment. The old riverbed was filled in for a distance of 500 feet upstream and blanketed with impervious material 6 feet thick. This was done to prevent water from percolating down through the soil into the old bed of the Olen-tangy.

The initial cofferdam was removed and the remaining section of earth dam was then completed behind the second cofferdam. The two low monoliths were next brought up to grade to complete the spillway structure.

Concrete Batch Plant

Delivery of material to the job site was simplified with a railroad of the Pennsylvania Railroad only ½ mile away at Marion Pike siding. A 2,000-foot siding was built off the main track to accommodate the hopper-bottom cars which delivered the aggregate for the concrete. Bulk cement was unloaded at a separate 500-foot siding located about ¼ mile northwest of the

railhead previously mentioned.

Crushed limestone, used for the coarse aggregate, was delivered by the National Lime & Stone Co., of Marion, Ohio. The Portsmouth Sand & Gravel Co., of Portsmouth, Ohio, supplied sand, which because of its relative coarseness had to be blended with a finer variety. The fine sand was supplied by the Great Lakes Foundry Sand Co., of Detroit, Mich. Most of the cement used was Medusa, coming from Wampum, Pa., with smaller amounts furnished by Universal Atlas and Lehigh.

The cement was unloaded at the siding into a Blaw-Knox 250-barrel storage bin and hauled to the job in an enclosed dump truck. The aggregate was unloaded from the hopper-bottom cars by a 30-inch conveyor belt, 82 feet long, into a 60-ton 2-compartment bottom-gate bin which would accommodate a full carload. From four to five trucks were used to haul the material to the job site. The trucks averaged 7 tons to a load, and picked up the material by running under the hopper of the storage bin. From 25 to 30 railroad cars were unloaded in a day.

The concrete batch and mixing plant was purchased by the contractors from the TVA, and erected a few hundred feet downstream from the spillway section. Standing 100 feet high, the upper portion consisted of a C. S. Johnson batcher; it had a 600-cubic-yard aggregate bin divided into six compartments for the four grades of



C. & E. M. Photo
At the east dam abutment a Lorain Mott-Crane with an 80-foot boom shifts one of the cantilever form panels.

mixers on the level below.

Vinsol resin for air entrainment was added by an automatic dispenser, and the correct amount of water was admitted into the drums. Water for the concrete came from a deep well which supplied a pressure-tank system at 200 gpm with an electrically driven pump. The controls on the batcher were air-driven and operated by one man. An interlocking system made it impossible to dump a batch into a mixer already loaded, or not in a proper position to receive the batch. Air for the controls was supplied by a 200-cfm electrically driven compressor.

The Mix

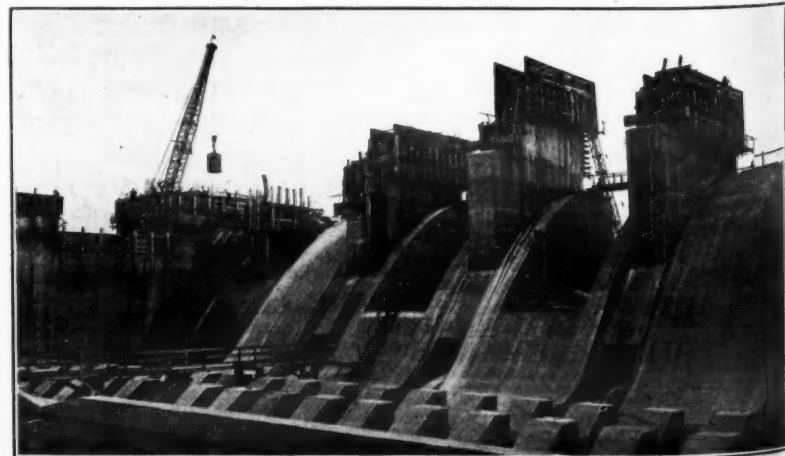
Batches were mixed for a minimum of 1½ minutes. Then the mixers discharged into a 6-yard collecting hopper under which the batch trucks pulled, each carrying Dravo 2-yard concrete buckets.

Three classes of concrete were poured into the dam: A, which has a 1½-inch maximum-size aggregate and was mixed 5 bags of cement to the yard; B, 3-inch maximum-size aggregate and 4½ bags to the yard; and C, 6-inch maximum-size aggregate and 4 bags to the yard. The majority of the concrete yardage falls in Class C, which is non-reinforced.

The 2-yard batches were mixed in the proportions 1 : 2.42 : 6.97 for C concrete, and had a water-cement ratio of 0.50 with a 3 to 4 per cent air entrainment. The solid design weight of the concrete is 154.8 pounds to the cubic foot. The dry weights of a typical 8-bag batch of C concrete were as follows:

Cement	752 Pounds
Water	376
Sand	1,602
Sand, extra-fine	220
6-inch aggregate	1,834
3-inch aggregate	1,728
1½-inch aggregate	1,416
¾-inch aggregate	264
Total	8,192

The gradation of the coarse and fine
(Continued on next page)



C. & E. M. Photo
From the east abutment of Delaware Dam, we look at the downstream face of the 232-foot concrete spillway section. Pour is in progress at the west abutment; a Dravo 2-yard concrete bucket is being emptied into the forms.

aggregate in a batch was as follows:

Per Cent Passing	Coarse Aggregate	Fine Aggregate
95-100
80-90
60-80
30-60
12-30
6-10
95-100
80-90
60-80
30-60
12-30
6-10

Handling and Placing Concrete

From three to six flat-bed 1½-ton trucks transported the concrete buckets from the batching and mixing plant an average distance of 400 feet to the concrete portion of the dam. The buckets were set within a 4-inch pipe frame built around the edge of the truck bed. The trucks ran over the ground to the work area where a Bucyrus-Erie 54-B crane with a 110-foot boom picked up the 2-yard bottom-dump buckets and emptied them into the forms, having first placed an empty bucket on the truck bed in back of the full one.

The truck returned with the empty bucket, and swung under the batch tower where a gate made from an 8-inch channel dropped into a locked position behind it. The gate movement was also controlled by compressed air. The truck then backed up with the bucket pushing against the gate. This forced the bucket forward to the front of the truck bed where it was in position for loading, and also made room for the crane to set the empty bucket at the rear.

Wooden cantilever forms in panels 5 feet 3 inches high x 16 feet 3 inches long were used over most of the work; shorter panels in 10-foot 10-inch and 5-foot 5-inch lengths were required for odd lengths of monoliths. The panels were made of 2-inch tongue-and-groove sheeting backed by horizontal 3 x 8 studs on 12-inch centers. The vertical wales were single 8 x 12's, acting as cantilever arms, 12 feet long, and were set on 5-foot 5-inch centers. Work scaffolds were built along the bottom of the wales. In pouring the pier sections, the two opposite wall forms were secured by Richmond Tyscrus.

Alternate monoliths were poured in 3-foot lifts, with the concrete in the spillway section being placed on a 5 per cent upward slope from the upstream to the downstream face. After a pour the form panels were raised for the next lift either by a Lorain Moto-

Crane with an 80-foot boom, or by a combination of A-frames and 3-ton Coffing jacks, one to a panel. The spillway was divided into 7 monoliths, while each abutment contained 9, the widths varying between 30 and 47½ feet.

The structure is founded on a solid stratum of limestone which required very little grouting. Only 1,300 bags of cement, or 1/9 of the estimate, were required, with some holes taking only 5 bags. The grout holes were drilled with a Sullivan core drill.

When the 2-yard bucketloads of concrete were dumped into the forms, the large piles were at once knocked down and leveled off with Jackson 2-man internal vibrators operating on an 80-cycle frequency. Two to three of these were in each monolith along with one Viber electric vibrator. The latter was used chiefly around the sides of the forms and between the seams of the concrete.

After about 4 hours, when the concrete had gained an initial set, it was cut back with an air and water jet to

roughen the surface and make a better bond for the next lift. Air for the jet was furnished by a Le Roi 315-cfm compressor while a Gorman-Rupp 3-inch pump supplied water from the river. The jet operated at 150-pound pressure. The concrete was cured with water sprayed on from perforated pipe which was laid over the surface of the monoliths.

As much as 60 cubic yards of concrete per hour was mixed and placed with this set-up and equipment. The average, however, was 600 cubic yards of concrete over two 10-hour shifts.

Earth Dam Embankments

Of the 3.5 miles of rolled-fill embankment included in Delaware Dam, 1.4 miles lies on the right bank of the river. From the spillway this section runs west a short distance, turns northward along the east side of U. S. 23, and then crosses U. S. 23 and runs west for a distance of 1,800 feet. It averages 20 feet in height and 110 feet wide through the base.



C. & E. M. Photo
At the west abutment of the Delaware Dam spillway section, a Bucyrus-Erie 54-B crane with a 110-foot boom lifts a Dravo 2-yard bucket of concrete to be emptied into the forms.

The flanking earth dam east of the spillway on the left bank runs out for 2.1 miles to high ground with only one (Concluded on next page, Col. 2)

CUT CONSTRUCTION COSTS

ONE MAN

Handling all controls, one man can drive a Mixermobile or Towermobile to the job, set up for operation in 15 to 30 minutes, hoist and pour concrete up to 50 yards per hour.

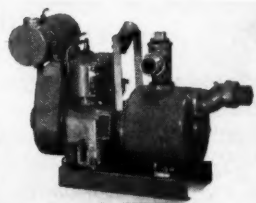
TOWERMOBILE

Saves all the preparation and last-minute rush of rigging up a hoist or runways to get the concrete up to the pour. Standard tower height is 45 feet ... raised or lowered mechanically. One competent operator can hoist and pour 50 yards of concrete per hour. To hoist other building materials, elevating bucket is interchangeable with a 6-ft. x 6-ft. platform.

MIXERMOBILE

Efficiently mixes and hoists concrete ... at lower cost per man hour! Driven right to the pour, MIXERMOBILE can be set up ready for operation in less than 30 minutes. Can mix and hoist up to 50 yards per hour. Has self-loading ship—2-yard mixer—standard elevating tower of 35 feet with one 10-foot extension. Tower height can be extended to a recommended limit of 55 feet.

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WRITE DEPT. CE, FOR COMPLETE INFORMATION AND NAME OF YOUR NEAREST DEALER



Here is the Hauck Model 215 double-burner heater mounted on steel wheels. It delivers a $4\frac{1}{2}$ x 42-inch flame at 2,000 degrees F, and is equipped with a 20-gallon double-valve fuel tank.

Heaters and Thawers Aid in Winter Work

Portable heaters and thawers are a special need at this season of the year. Several new models of this type of equipment have been added to its line by Hauck Mfg. Co., 124-136 Tenth St., Brooklyn 15, N. Y. These include single and double-burner units and the Model No. 548 ground-thawing equipment. They are said to produce flame with a heat of 2,000 degrees F and, in the case of the ground-thawing equipment, an equivalent radiated heat.

In the single-burner line, Model No. 213 is said to deliver a $3\frac{1}{2}$ x 30-inch flame; Model No. 214, a $4\frac{1}{2}$ x 36-inch flame; and No. 215, a $4\frac{1}{2}$ x 42-inch flame. A special metal-wheel chassis is available for transportation of Model No. 215. In the double-burner line, models with the same numbers deliver two flames in the sizes listed. Fuel-tank capacities are increased, and other adaptations have been made to convert them to the two burner style.

The complete No. 548 ground-thawing equipment consists of a 15-gallon-capacity fuel tank with a heavy brass long-stroke hand pump, 100-pound pressure gage, tank needle valve with male union and filler cap with automatic air release, 12 feet of oil-resisting hose with union connections, No. 215 burner giving a $4\frac{1}{2}$ x 42-inch flame, thawing shield with legs, and an adjustable bracket and clamp for attaching to the burner.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 12.

1948 Weekly Calendar

A 1948 wall calendar 12 x 20 inches in size is being offered by The Frederick Post Co., P. O. Box 803, Chicago 90, Ill. Theme of this weekly calendar is "Steam Shovel at Work". It is printed in a four-color process, said to produce six-color tone effects. The numerals denoting the days of the months are $1\frac{3}{4}$ inches high. Beneath these numerals are calendars for the preceding, present, and succeeding months. The backs of the sheets contain a full 12-month calendar and engineering data.

Free copies of this calendar may be obtained from the company. Or use the enclosed Request Card. Circle No. 54.

Wickwire Sales Head

A. G. Bussmann, sales head of the Wickwire Spencer Steel Division of The Colorado Fuel & Iron Corp., died recently at the age of 61. He had been associated with the Division since 1931.

H. C. Allington has been appointed General Manager of Sales of the Division. His offices will be located in New York City. With the company since 1943, Mr. Allington held the position of Assistant General Sales Manager until his present appointment.

Earth Dikes Flank Concrete Spillway

(Continued from preceding page)

fairly flat angle in its alignment. It averages 13 feet in height and 75 feet wide through the base. The 10-foot crown along the dam is at elevation 957. Adjoining the abutments the earth sections are 432 feet wide at the base.

Both side slopes are generally $2\frac{1}{2}$ to 1, while the upstream side is faced with dumped riprap from the base up to elevation 930 adjacent to the spillway. The spillway excavation furnished about half the stone for the riprap; a Northwest $1\frac{1}{2}$ -yard shovel loaded the material to two 13-yard end-dump Tournatrailers.

The first operation was digging an inspection trench along the axis of the dam, over 18,000 feet long x 10 feet wide at the bottom x 6 feet deep with 1 to 1 side slopes. A Northwest $\frac{3}{4}$ -yard Pull-shovel did the excavating. Following that, construction got under way on the east embankment which required 500,000 cubic yards of fill. The material was obtained from four borrow pits, most of which were upstream of the dam and had haul distances from 500 to 1,600 feet. The west embankment, higher and wider although shorter than the east, took 550,000 yards of dirt; this came from two pits, also upstream, with hauls from 500 to 1,000 feet. The material was placed so that the greatest concentration of impervious material was at the center of the dam. Most of the dirt from the pits was brown silt with clay.

On the hauls up to 800 feet the dirt was usually moved by a fleet of six LeTourneau FP 16-yard Carryalls pulled by Caterpillar D8 tractors, with a couple of D8's acting as pushers in the pits. On the longer hauls five bottom-dump 13-yard Euclids, loaded by a Northwest dragline with a 50-foot boom and a 3-yard bucket, carried the dirt.

The fill was spread in 8-inch lifts and compacted with at least three passes of a sheepfoot roller. Extra compaction was provided for in the specifications but it was never found necessary. Two Grace 48-inch drums were pulled abreast over the freshly placed fill by a D7 tractor. An Allis-Chalmers Model L tractor-dozor and an Austin-Western motor grader shaped the embankments to proper grade. Water seldom had to

be added to the borrow-pit material, but two 2,000-gallon GMC tank trucks were available when needed.

Quantities and Personnel

The major items in the contract included the following:

Excavation, borrow	1,050,000 cu. yds.
Excavation, common	175,000 cu. yds.
Excavation, rock	5,800 cu. yds.
Roller embankment	990,000 cu. yds.
Dumped riprap	11,000 cu. yds.
Drilling, 2 and 4-inch holes	2,860 lin. ft.
Pressure-grouting of foundation	1,300 bags
Concrete, Class A	600 cu. yds.
Concrete, Class B	23,200 cu. yds.
Concrete, Class C	44,400 cu. yds.
Reinforcing steel	400,000 lbs.
Structural steel	270,000 lbs.
Crest gates	365,000 lbs.

The three contractors—Johnson, Drake & Piper, Inc., S. J. Groves & Sons Co., and Bowen & McLaughlin—were represented on the Delaware Reservoir project by G. M. Gaussa, Project Manager; W. L. Williams, Assistant Project Manager; and J. B. Romans, Chief Engineer. For J. C. O'Connor & Sons, Inc., subcontractor on the earth work,

William B. Machin was Superintendent and Roy B. Dexheimer was Chief Engineer. A force of 230 was employed.

For the Department of the Army, Corps of Engineers, A. A. Johnson was Resident Engineer; John Marsters, Assistant Resident Engineer; and Robert T. Quick, Office Engineer. The project is under the supervision of the Huntington District, of which Col. A. M. Nielson is District Engineer, Lt. Col. John R. Sharp is Executive Officer, Harry Pockras is Technical Assistant, and John J. Konrad is Chief of the Construction Division.

Eimco Expands in Chicago

The opening of a new office to handle its expanded Chicago facilities has been announced by The Eimco Corp., Salt Lake City manufacturer of mucking machines, vacuum filters, and other equipment. The new office is in the Mayflower Bldg., 3319 So. Wallace St.

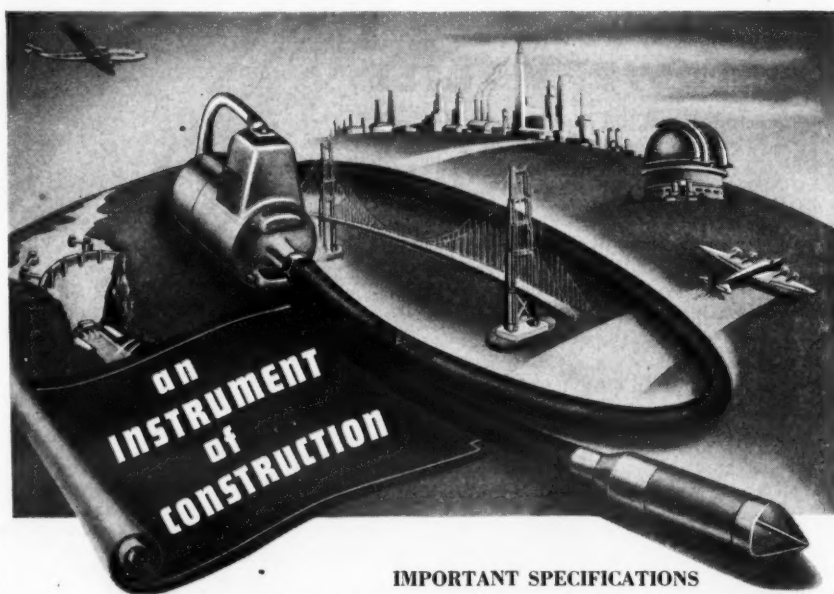
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To obtain maximum density and strength in concrete, it is important that the entire mix be given internal high speed vibration. This reduces voids, honeycombs, shrinking and cracking, also placing and compaction time. Built to withstand the strain on heavy construction jobs, the VIBER Vibrator makes practical the use of drier mixes. The interchangeability of VIBER units permits quick conversion to changing job conditions, eliminating delays, and the light weight portability offers easy one-man operation.

Important facts and specifications on VIBER Vibrators furnished upon request.

IMPORTANT SPECIFICATIONS

Optional electric, pneumatic or gasoline motor... flexible casing fabricated from multiple laminations of high tensile strength wire braid, spirally wound fabric, covered with tough, live rubber... interchangeable flexible cores of high quality steel... Vibrators made from heat treated alloy steel with hardened outside surface (weight assemblies mounted on ball bearings)... motor bearings sealed and packed with lubricant at factory, need no further lubrication; weight assemblies mounted on open type, single row, radial bearings; and splash system oil-bath lubricates the bearings and dissipates the heat... an instrument of quality and durability.



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Aerial Strip Photos Aid Highway Studies

New Technique Provides A Quick, Easy Method Of Gathering Information On Pavement Performance

By JEAN E. HITTLE, Research Engineer,
Joint Highway Research Project, Purdue
University

HIGHWAY research has shown that pavement-performance data provide a logical and expedient method of analyzing materials and construction problems encountered by highway and airport engineers. Where compilation of a mass of such data is possible, it permits an analysis of the problems with respect to engineering soil areas, the factors of traffic and design, the type and source of materials, and/or any of the other factors which may contribute to pavement performance.

Thus, from a practical viewpoint, pavement-performance surveys provide the basic fundamentals for organized research on many of our highway problems. Many state highway organizations have initiated research programs in which laboratory and field research are coordinated with the results of pavement-performance surveys.

However, conventional methods of gathering pavement-performance data are tedious and often time-consuming, since in many instances the study of a particular problem may require periodic performance surveys on several miles of pavement. And where the problem warrants a detail treatment, the task of securing the necessary performance data becomes one of major proportions. Fortunately, a method of aerial strip photography was developed during the war which offers a quick, convenient method of recording the essential features of pavement performance that heretofore could be gathered only by a visual inspection in the field.

A few of the performance details that can be recorded by means of strip photographs include blow-up patches, cracks, and corner breaks on concrete pavements; also, base failures and surface patches on bituminous surfaces. This new technique also has several other potential uses in highway and airport engineering. But its unique application to pavement-performance surveys is highly significant in view of the immediate need for performance information in the advance planning of highway programs.

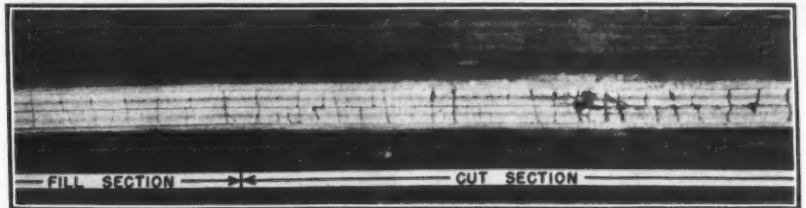
Aerial Strip Photography

The technique of aerial strip photography was developed during the war for the armed forces. With the cessation of hostilities, it was made available for peacetime planning and engineering of highways and airports, as well as other works of civil engineering.

It differs from the conventional aerial photography in that a continuous, uninterrupted strip photograph is produced instead of a series of overlapping photographs. The continuous uninterrupted exposure of photographic film (as much as 200 feet in length) is made possible through the use of a specially designed aerial camera which is adapted to low-altitude photography at high airplane speeds. Thus large-scale strip photographs, up to 1 inch equals 25 feet and covering a strip of terrain several miles in length, can be obtained in a relatively short time. These features of aerial strip photography make it well suited to highway problems, since the scale and coverage of the photograph can be adapted to the required detail and right-of-way width.

To obtain stereoscopic photographs, an aerial camera with a double-lens

system is used; this exposes duplicate images on either half of the film width, with the necessary separation to facilitate stereo-coverage of the terrain shown in the strip photographs. A slight amount of displacement between the duplicate images permits an impression to be gained of the topography of the terrain and the relative height of objects in the photographs by viewing the duplicate strip photographs in a continuous roll through a special mirror-type stereoscope. This feature of



The contrasts in pavement performance between the cut and fill sections of highway shown in this strip photo have been correlated with the source of coarse aggregate and the relative moisture associated with soil textures.

aerial strip photography broadens its application to pavement-performance surveys in that it facilitates the correlation of pavement performance with cut and fill sections.

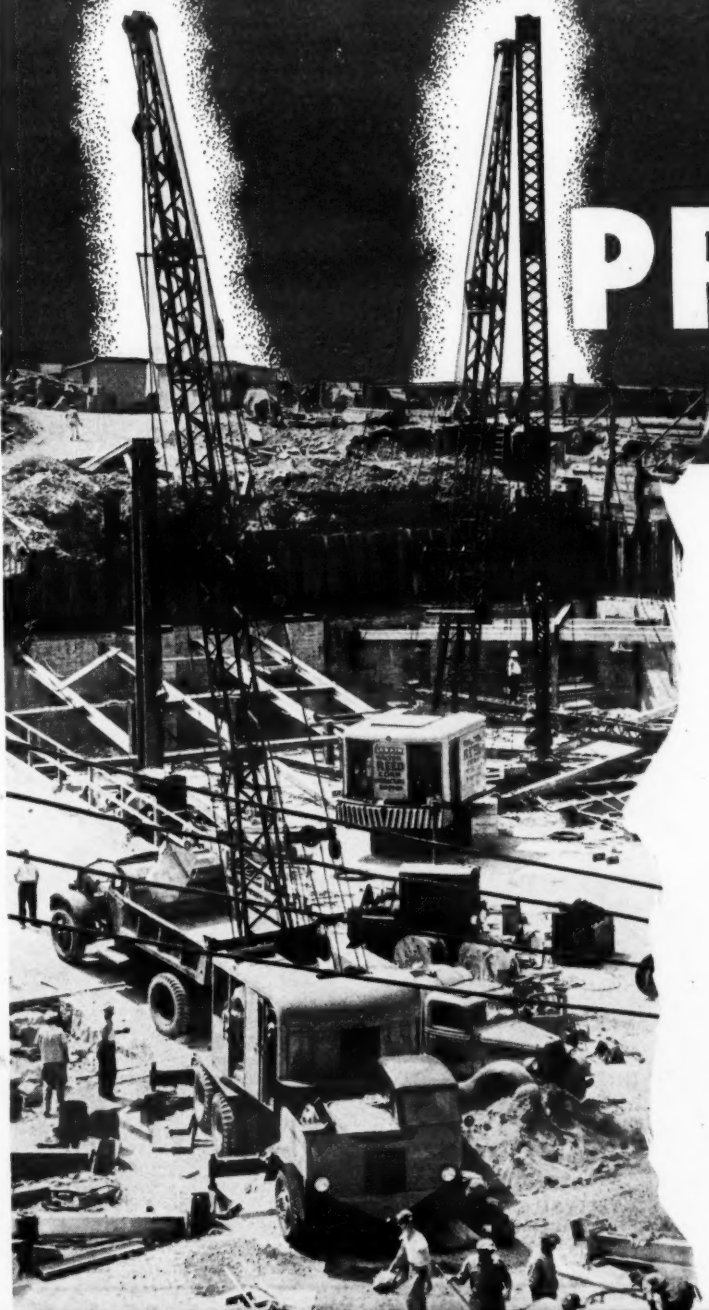
Performance Surveys

The present need for pavement-

performance information in order to evaluate our many materials and construction problems makes the application of aerial strip photography to this phase of highway and airport engineering an outstanding one with an immediate practical use. With this in mind,

(Continued on next page)

TEAM 'EM UP for PROFIT!



More and more contractors are creating work teams composed of two or more machines from the complete line of Lorain shovels and cranes. Typical example is foundation project for the New England Telephone & Telegraph Co., Boston, Mass. It covers approximately one acre with depth of excavation ranging from 40 to 70 feet. Pictured in background is one of five larger Lorains used for heavy-duty service by the Walter Reed Corp. In the foreground you see a highly mobile Moto-Crane of Thompson & Dobbins which insures fast handling of the scattered, miscellaneous jobs.

Crawler shovels ranging in capacity from ½ to 2 yd. classes, plus a complete selection of 4 and 6 wheel rubber-tire mounted units in the ½ and ¾ yd. class—that's today's modern Lorain line with all units readily convertible to shovel, crane, clamshell, dragline or hoe operation.

And, no matter what combination of capacity and mobility your work demands, you are assured efficient over-all performance with an all-Lorain team. For complete information, write or call your local Thew-Lorain distributor.

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Aerial Strip Photos Aid Highway Studies

(Continued from preceding page)

the Joint Highway Research Project, cooperating with the Indiana State Highway Commission, initiated a limited strip-photography program. Strip photographs were obtained for a number of highway locations, including bituminous surface treatments, rock-asphalt resurfacing, and concrete pavements.

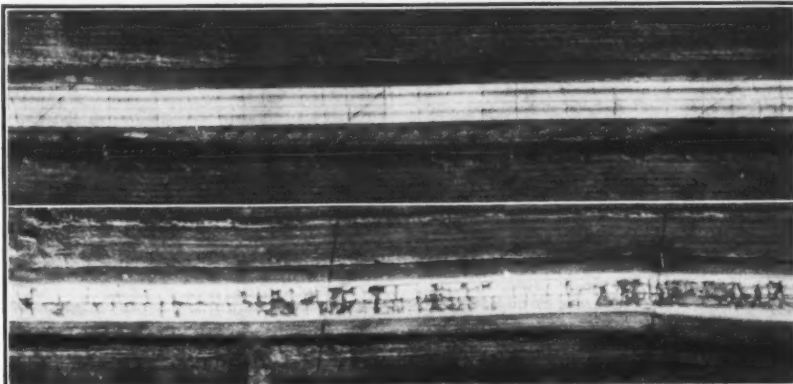
One strip photo covers a secondary highway, Indiana State Route 8, which has a bituminous surface treatment. It shows up areas in which the bituminous material has bled to the surface, causing "fat-spots" in the surface course. This type of performance data is often difficult to gather by field inspection, yet the location and extent of these fat-spots are shown in detail on the strip photo.

On a highway location on Indiana State Route 43, where a rock-asphalt resurfacing has been employed, numerous failures of the rock-asphalt surface have taken place because of weak base support. Accordingly, these areas of surface failure have received maintenance and are shown in remarkable detail on the strip photo.

Another strip photo covers a dual concrete pavement on U. S. 30. These two pavements have the same design, and were constructed the same season under the same contract. However, the influence of the traffic variable upon pavement performance is clearly indicated in the strip photo. It can be seen that the "oil-streaks" are confined to the outside or traffic lanes, thereby indicating that they carry a larger volume of traffic than the inner or passing lanes.

It can also be noted that the lower traffic lane has received a considerable amount of maintenance in the form of bituminous skin patches. The fact that these skin patches are confined to the outside lane again indicates that it carries the larger volume of traffic. Likewise, a comparison between the two outside traffic lanes on the basis of the maintenance required indicates that the lower traffic lane has carried the heavier traffic. Therefore, it is concluded that the differential in performance on the upper and lower traffic lanes must be attributed to a corresponding differential in the volume and intensity of traffic.

Thus, from the examples of these strip photos covering three types of pavement surface, some of the benefits to be gained from using aerial strip photo-



These two pavements have the same design, comparable subgrade soils and traffic, and are approximately the same age. The differences in the physical characteristics of the coarse aggregates used in the two pavements have produced corresponding differences in performance, as shown by comparing the strip photos.

graphs to gather pavement-performance data are more or less self-evident. Probably the most tangible benefit comes from the fact that they quickly and accurately make a permanent record of the pavement performance. In

many instances certain pavement-performance data all but defy a written description. Engineers, therefore, often have difficulty in gathering this type of information. For this reason, those familiar with the task of gathering it

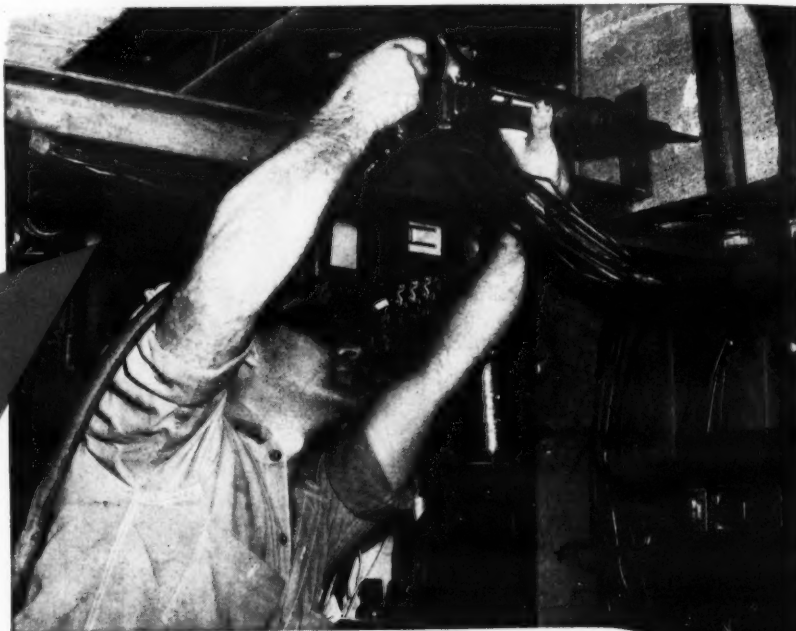
will no doubt have a keen appreciation of the application of strip photography to performance surveys as well as the accuracy with which the strip photograph records performance details.

Soil-Texture Studies

The soil texture of the subgrade continues to be an important factor contributing to pavement performance. Take, for example, a portion of a strip photo covering a location on U. S. 41 in northern Indiana. In the upper portion of the strip photo is a newly constructed concrete pavement. In the lower portion is an older concrete pavement which has had several years of service under heavy traffic. A comparison of the pavement condition in the cut and fill sections shows an outstanding contrast. The pavement in the cut section has been patched over a considerable area while the fill section is entirely lacking in this type of maintenance. The poor pavement performance in the cut sections shows up in the form of slab

(Continued on next page)

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pumping. This contrast in performance must logically be attributed to the corresponding contrasts in the soil textures and moisture conditions encountered in the cut and fill sections.

A portion of a strip photo covering a location on Indiana State Route 25 in the northern part of the state again emphasizes the influence of soil texture upon pavement performance. A large area of the pavement in the cut section has been patched, and these maintenance operations are lacking in the fill section. A corresponding ground view of the pavement condition in the cut section shows map-cracking and disintegration of the concrete. The differential in the concrete performance must be attributed to the contrasts in the soil textures encountered in the cut and fill sections. However, current studies of the Joint Highway Research Project have shown that the map-cracking and disintegration of the concrete are correlated with the source of coarse aggregate and the relative moisture conditions associated with soil textures.

The influence of soil texture and the associated moisture conditions upon pavement performance is further illustrated by strip photos covering adjacent cut sections on U. S. 31 in southern Indiana. One strip photo covers a cut section on a sand subgrade. At this location the highway cuts through a sand dune. In an adjacent section, where the highway goes through a railroad underpass, another and deeper cut section is encountered. In this cut section the subgrade soil is a plastic silty-clay. A strip photo recording the pavement performance in this cut section shows that numerous patches have been made in it. It is significant to note that the poor pavement performance is restricted to the cut section where the silty-clay subgrade soil is encountered.

The contrast in pavement performance between these two adjacent cut sections is attributed to the contrasts in soil textures of the sand and silty-clay subgrades. However, the poor performance of the pavement in the silty-clay cut section has been caused by pumping joints, which continue to be a problem of concrete-pavement design where silty-clay and clay-like subgrades are encountered.

The poor performance in a cut section on Indiana State Route 25 located in the northern part of the state shows up in the form of concrete disintegration which is unusually severe in the cut sections. It has been attributed to the source of coarse aggregate employed. A cut section on Indiana State Route 29 located in central Indiana was also photographed. Both of these pavements are constructed without joints and are therefore subject to transverse cracking. However, except for these cracks, the Route 29 pavement is showing good performance in both cut and fill sections.

These two concrete pavements are of the same design and are approximately the same age. Likewise, they are lo-



A strip photo shows up base failures on a rock-asphalt pavement.

cated on comparable subgrade soils and carry comparable traffic. Since both of the pavement locations are in cut sections, the striking contrasts in their performance demonstrates the significance of coarse aggregate to concrete performance. Also, the contrast in performance of these two pavements indicates that cut sections do not always produce poor pavement performance.

Value of Strip Photos

The strip photos just described demonstrate a few of the different types of pavement-performance data that can be recorded by aerial strip photography. Since such data can be gathered by this method in a relatively short

time, it is possible to gather them on a number of widely separated highway locations. This feature is a distinct advantage, since by conventional methods of field inspection, it frequently requires several weeks or months to gather the data alone for performance surveys on locations which are a considerable distance apart.

It has long been recognized that many deficiencies in pavement performance have a nation-wide significance to our Federal highway system; that many materials and construction problems are not limited to political boundaries but often prevail throughout large areas or regions. Therefore, with pavement-condition records in the form of

strip photographs from widely separated locations, engineers could more effectively evaluate the factors contributing to performance such as types and sources of materials, climatic influences, subgrade soils, and traffic and design.

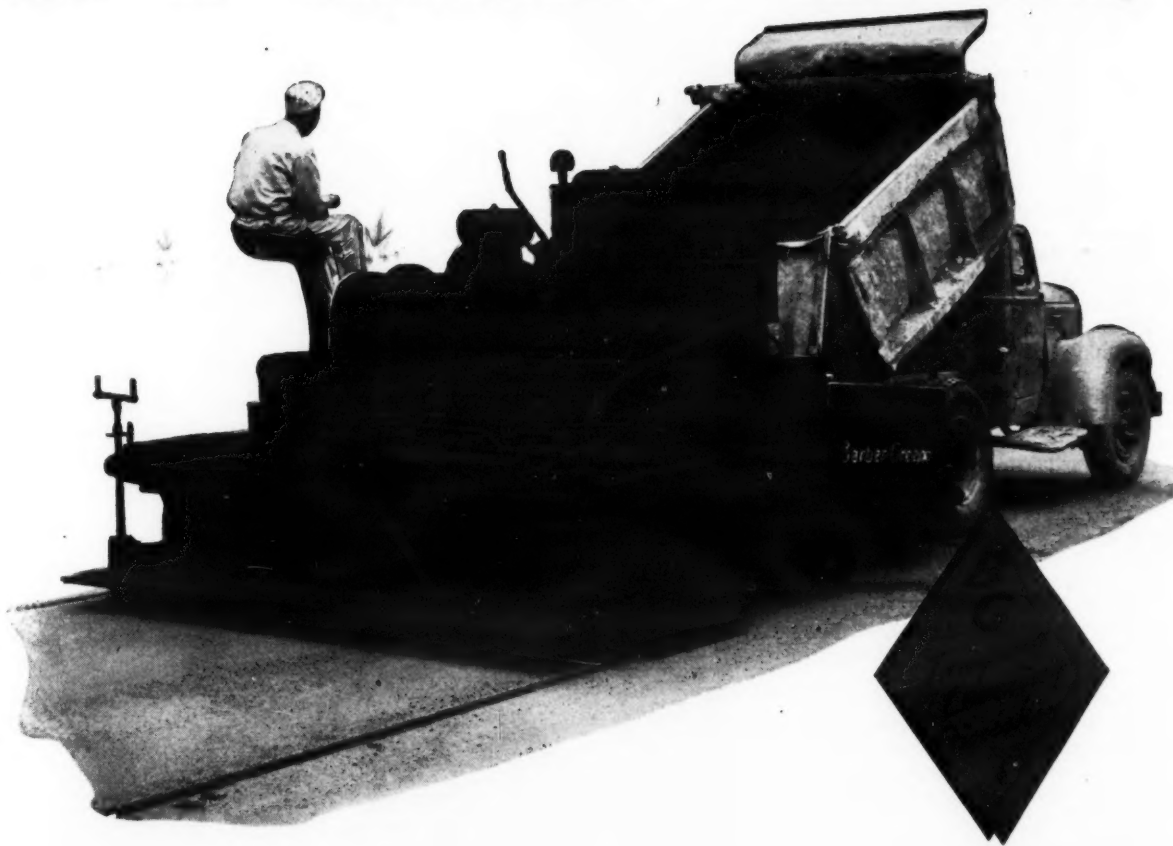
Performance data recorded on strip photographs of existing highways can also serve in the administration of highway departments as well as in the research of materials and construction problems. One such use of strip photographs by administrative officials is in the periodic evaluation of their maintenance and reconstruction needs. Here again the evaluation can be made by comparing the strip photograph showing past maintenance and performance of the highways under consideration.

Likewise, decisions on surface retirement can be treated in a similar manner. It is frequently difficult to render decisions on the maintenance and reconstruction needs of a highway system, since several widely separated

(Concluded on next page)

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Aerial Strip Photos Aid Highway Studies

(Continued from preceding page)

locations are usually involved. However, a comparison of strip photographs covering these locations facilitates an intelligent evaluation of conditions of performance and maintenance.

Location Surveys

In addition to its application to performance surveys on existing highways, aerial strip photography also has a potential application to location surveys on new highway construction. Although there is a slight difference between the graphic representations on an aerial strip photograph and a corresponding planimetric map, ground distances can be determined from large-scale strip photographs with fair accuracy. Also, equipment is available for determining with fair accuracy the height of objects as well as the height of the ground profile from stereo strip photographs. These features of aerial strip photographs, added to the fact that the scale and coverage of the photograph can be adjusted to the desired detail or right-of-way width, make many of the applications to location work more or less self-evident.

Because of the limitation of precise accuracy, the more practical applications of strip photography to complete location surveys can be made where the surveys are of a reconnaissance nature. In these instances, the use of strip photography can effect a considerable saving of time and expense. An application of this type is frequently encountered in by-pass locations; for there the high cost of right-of-way in urban and suburban areas often makes it necessary to consider alternate locations in order that the most feasible and economical one can be adopted. Likewise, where the choice of a highway location is contingent upon the clearing of timber, a reasonably accurate estimate of size and number of trees involved can be made from a strip photograph covering the location in question.

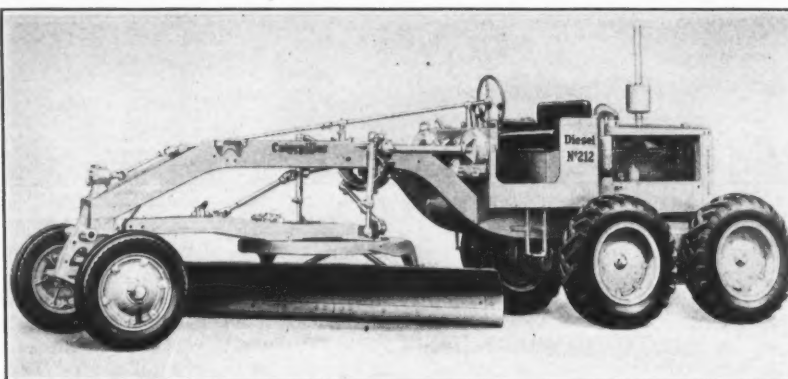
Another application of strip photographs to location surveys is in obtaining the so-called "topo" information. When done in the field this work consists mainly of locating fence lines, access drives, trees, etc., and only moderate accuracy is required. With the use of strip photographs this same work can be performed with corresponding accuracy and with considerably less cost. Those familiar with field survey work will no doubt appreciate the benefits of this use of strip photographs. Other applications of aerial strip photography to location work include reconnaissance surveys for the location of power transmission lines and pipe lines, or any other installation which requires a narrow, cross-country right-of-way.

From a paper presented at the Thirty-Third Annual Road School at Purdue University.

Large Motor Grader Has Increased Power

A new diesel No. 212 motor grader has been placed in production by the Caterpillar Tractor Co., Peoria 8, Ill. It is said to have a maximum output of 45 hp; increased speed in all four forward speeds; power-operated mechanical controls equipped with effective brakes which prevent creeping or coasting; arched front axles; and improved metals used in construction. It is powered by another new diesel product, the Caterpillar D311 engine.

The new No. 212 is made in tandem or single-drive models, with single low-pressure tires. Speed in fourth gear is 11.2 mph, and in reverse, 2.6 mph. The blade is 10 feet x 20 inches x 1/2 inch; its lift above ground is 15 1/2 inches; it has



The new Caterpillar No. 212 motor grader has a maximum output of 45 hp, and is powered by another new diesel product, the Caterpillar D311 engine. Increased speeds, power-operated controls, and arched front axles are among the grader's features.

maximum circle rotation and is fully reversible; side shift, power-operated, is 33 3/4 inches; bank-cutting angle, maximum with horizontal, is 90 degrees; maximum shoulder reach outside of rear wheels is 60 inches; and maximum vertical reach for bank cutting is

10 feet.

Front tires are 6.50-20; rear tires are 13:00-20 for single drive, and 10:00-24 for tandem drive. For the tandem model, overall length is 21 feet 11 inches; width is 6 feet 9 1/2 inches; and overall height is 9 feet 6 inches. The

wheelbase is 16 1/2 feet and the total weight is 13,130 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 43.

Mower Travels at 13 MPH

A power mower said to travel at speeds up to 13 mph for use on roadsides and parkways is described in a folder available from The Flink Co., Streator, Ill. In addition to its uses for mowing, the Flink-Rawls unit is recommended by the manufacturer for use with various attachments such as small snow plows, rollers, brooms, etc.

The folder shows the unit at work as a mower and with these attachments. It contains a list of nine features of the mower. It also contains a complete list of specifications covering all phases of performance, construction, and operation of this 4-hp unit.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 76.

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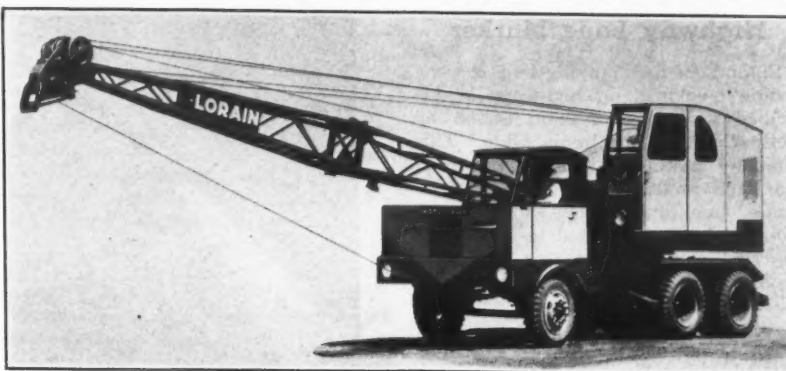
TEXACO

Crane Dual Control

A dual-control feature said to combine the between-jobs mobility of the high-speed Moto-Crane and all of the on-the-job features of a self-propelled unit, has been announced by The Thew Shovel Co., Lorain, Ohio. Dual control is now available for installation on any Lorain Model TL-20 mounted on a standard 4 x 4, 6 x 4, or 6 x 6 rubber-tired Moto-Crane carrier which utilizes the carrier engine and automotive propelling and steering mechanism for traveling.

With this unit installed, the machine can be converted into a self-propelled unit within 5 minutes, according to the manufacturer, with on-the-job travel powered by the turntable engine only. All steering and brake controls are located at the operator's position in the turntable cab. Steering is controlled by air power. A 5-minute adjustment is said to re-convert the machine for highway and off-the-road travel.

Further information may be secured



Dual control provides this Lorain Model TL-20 Moto-Crane with the between-jobs mobility of the high-speed Moto-Crane and all on-the-job features of self-propelled units. Once it is installed, a 5-minute adjustment converts the machine into a self-propelled unit or reconverts it for highway travel.

from the company, or by using the enclosed Request Card. Circle No. 48.

Penn Appoints Parts Mgr.

In order to coordinate the efforts of its four parts departments, the H. O.

Penn Machinery Co., New York distributor of construction equipment, has announced the appointment of a General Parts Manager. The position will be held by Alexander (Al) La Penna. He has been with the company since 1936.

Virginia Holds First Highway Conference

Group Urges Cooperation Between State, County, and City Officials; Diversion of State Highway Funds Is Not Contemplated

★ DUE to the success of the first Virginia Highway Conference, the sponsoring organizations are considering an annual Old Dominion Road School. The conference was held at the Virginia Military Institute in Lexington, Va., Oct. 31 and Nov. 1, and was jointly sponsored by the Virginia Department of Highways and the VMI engineering department.

It was primarily organizational in nature, and the sponsors were aided in arranging the conference by the Public Roads Administration, the Virginia Division of Motor Vehicles, State Police, the League of Virginia Municipalities, the League of Virginia Counties, and the Virginia Road Builders' Association.

Cooperation Keynotes the Meeting

Throughout the session, the theme was cooperation between the various political sub-divisions of the state and other groups interested in highway matters. Commenting upon the amount of highway construction accomplished, Thomas H. MacDonald, Commissioner of the Public Roads Administration, said: "Credit for accomplishment must include county and city officials in addition to the state highway departments. For the first time, we have experienced truly national teamwork in the attack on our highway problems."

He said that steady progress is being made in construction and planning for all three types of roads provided for in the Federal-Aid legislation—principal routes, secondary roads, and urban streets. Mr. MacDonald predicted that highway work in the years ahead will be "limited only by the availability of those things necessary to carry on construction and the prices at which they may be obtained."

Virginia's Governor William M. Tuck, also stressing cooperation, said: "With the advice and counsel of the public officials of the counties, towns, and cities throughout Virginia, the State Department of Highways will be enabled to revise, strengthen, and add to its plans in the knowledge that its goals are in the best interest of the public and are undertaken with the approval and support of the authorities in the various localities."

Larger Representation Urged

James A. Anderson, Commissioner, Department of Highways, urged that despite the large statewide turnout, future conferences include "more representatives of our counties, cities, and towns to tell us of their problems and their views of how these highway problems should be solved."

Commenting on the Byrd Road Law—which in 1932 incorporated the roads of 97 counties into the secondary-highway system—he stated that one of its wisest provisions "is that which requires the Highway Department and the Boards of Supervisors to be partners in the administration of our secondary roads. . . . There are now 38,000 miles of these roads in 97 counties. The budgeting of funds for maintenance and improvements, additions and abandonments, right-of-ways, and other problems are handled by this partnership. The Highway Department is the stronger and the State is the richer for this wise arrangement."

He pointed out that the three parts of the Highway Department's job are (1) modernizing "our obsolete primary system", (2) bringing secondary roads

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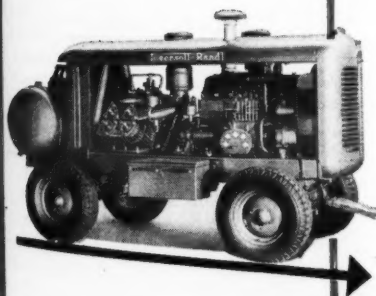
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"What are you acting so jittery about this morning?"

Virginia Holds First Highway Conference

(Continued from preceding page)

up to all-weather standards, and (3) solving the problem of urban arteries.

Governor Against Diversion

The subject of diversion of highway funds was discussed at this meeting. Governor Tuck and U. S. Senator A. Willis Robertson of Virginia both took firm stands against any such measures. Virginia uses a pay-as-you-go plan under which its roads are paid for as they are constructed; there are no bond issues outstanding for road debts. "The Virginia people have been far-sighted enough in the past—and I hope they will continue to be so in the future—never to divert any highway funds", asserted the Governor. And Senator Robertson expressed pleasure that "there is no current effort to divert any of our highway revenues".

Benefits of Road School

Ben H. Petty, Professor of highway engineering at Purdue University, where road schools have been held since 1913, told the group that as co-sponsors, the Highway Department and VMI "are embarking on a cooperative program which will react to the benefit of highway users throughout Virginia".

"Any road man who attends a school or conference of this kind", Mr. Petty continued, "cannot help picking up much beneficial information" that will enable him to handle more efficiently and economically his own local road problems. Referring to the Purdue school, Mr. Petty commented that he has been impressed by the fact that "those who have had the longest tenure of office in city, county, or state highway work are the most loyal and enthusiastic attenders and boosters".

Other important speeches were presented at the conference. Addressing the main banquet, ex-Governor Darden, now President of the University of Virginia, spoke on the seriousness of the international situation. Professor K. B. Woods, Associate Director of the Joint Highway Research Project at Purdue, gave an address, illustrated with slides, on highway research. He pointed to the many improvements brought about by research and emphasized the important place it holds in training better highway engineers.

D. B. LaPrade, Associate Construction Engineer for the Virginia Highway Department, discussed in detail the Federal-Aid Act of 1944. L. E. Akers, Assistant Maintenance Engineer, and W. Vance Baise, State Highway Engineer of North Carolina, spoke on the secondary-road system.

VMI Is Gracious Host

Acting as host, VMI treated the conference to a special full-dress review by its cadet corps, and at the banquet, to entertainment by the VMI band, glee club, and quartet. Members of the band also entertained at a reception following the meeting of highway-department engineers. At the conclusion of the conference, all delegates were guests of the VMI athletic association at a football game.

Highway Lane Marker

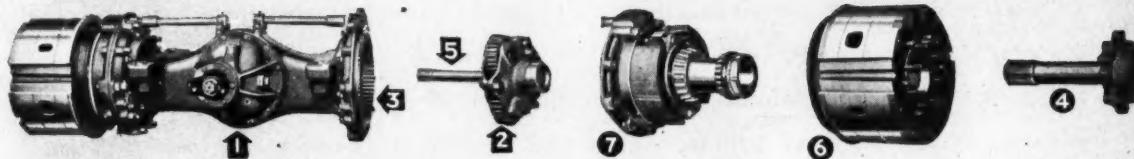
Equipment for applying lane or centerline markings on highways is described in a new bulletin issued by Kelly-Creswell Co., Xenia, Ohio. This company makes portable equipment of the hand and self-propelled type for single line application, and truck-mounted equipment that is capable of applying single, double, or two-color triple lines.

Feature of the folder is a description of the Kelly-Creswell air curtains which are said to produce a keen-cut straight-edged line without coming in contact with the surface. Other features listed are the striping gun, the pressure-cleaner mechanism, the Kelly-Creswell air-actuated traction for assuring a uniform film thickness, and others. A specially designed unit is available for laying reflector zone-marking materials.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 8.



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The driving parts of the Euclid axle are (a) — a primary reduction consisting of conventional spiral bevel ring gear, pinion and differential (1). (b) — secondary reduction of two floating planetary gear sets (2) each made up of a sun gear, three planetary gears and internal ring gear (3). The only parts carrying the full driving torque are the outer drive axles and hub caps (4). The inner axles (5) carry less than 1/5 of the torque delivered to the driving wheels (6) which are mounted on tapered roller bearings on the hollow spindles (7). The use of the planetary reductions makes possible minimum gear reductions in the transmission and differential and results in much lighter loads being imposed on all parts between the planetary gears and engine.

THIS double reduction planetary drive axle transmits tremendous pulling power with relatively little burden on the intermediate driving parts — transmission, differential; etc.

It is full-floating — all of the rear axle load being carried on heavy duty tapered roller bearings mounted on hollow axle spindles which keep axle shafts and gears entirely free from vehicle and payload weight. All working parts of this precision built axle assembly are completely enclosed in an oil bath.

This type of drive axle has been used in both Rear-Dump and Bottom-Dump Euclids for 14 years. Its strength and capacity are unequalled by any other axle in heavy duty hauling equipment. The Euclid axle is a highly important factor in the longer life and outstanding performance of Euclids.

The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio



Improved Alignment Eases Snow Removal

(Continued from page 1)

Division 8 is cattle country; rough, broken by badlands, with the Yellowstone River meandering down through its midst like a backbone. Ranchers in back country away from Miles City, Glendive, or other towns, need roads as do perhaps no other residents in the nation. Supplies bound for the ranches, and heavy truckloads of cattle on their way to market, all have to move over highways. Some ranches in Division 8 are 75 miles from a rail center.

Climate and Terrain Bad

The Montana State Highway Commission has served these people, depending on low budgets spread quite thin. Roads were not easy to build, but today the Division has 921 miles. The construction season is short. Soils away from the 15-mile Yellowstone River valley are down in the A4, A5, A6, and A7 classifications, with some of the stuff showing a swell factor as great as bentonite.

Back through the badlands country, men built state highways through rough terrain in poor soil. Winter temperatures as low as 50 degrees below zero froze the ground 6 feet deep. When the frost left, in the spring, subgrades turned soft and mushy.

There were times when alignment was perhaps not all that it might have been. Ice formed on the curves in winter. Snow removal was difficult. Sanders believes now that correcting many of these old errors of alignment may mark the way towards lowered maintenance costs.

He has some facts to prove his belief, too. On State Highway 7 from Ekalaka to Wibaux, much of the old crooked road has now been replaced by a state highway laid out mostly in tangent sections. In winter, the new straight road can be kept open by truck-mounted push plows, but over on the 15 miles of old highway remaining on this stretch, the biggest Snogo rotary plow made is necessary to get rid of the snow.

Alignment Theory Explained

Basically, Sanders' theory is as simple as it is sound. On a straight highway, push plows can maintain their speed while scooping off the snow. More important, so can traffic. An automobile traveling 55 miles an hour will whisk off the 1/2-inch layer a snow plow can't remove, but on a curve where speed cannot be maintained the vacuum is not great enough. And so ice gradually forms at those points; dangerous ice which is hard to handle.

Montana's snows are dry from October 20, when storms come, until early spring. When the weather moderates in March, maintenance crews can expect the snow to have a much higher moisture content.

With these factors to consider, Division 8 has now centered its entire snow-removal work around the use of fast one-way truck-mounted snow plows, backed by several V-plows and two rotaries for severe storms. As more crooked highways are realigned to straight sections, the job will get progressively easier, especially if the streamlined and blended Wyoming road section is adopted.

While more than 12 inches of snow seldom falls in one storm, it is generally accompanied by howling blizzard winds which reach 60 to 70 miles an hour. An inch of snow under those conditions frequently blocks a highway, unless plowing is immediate and continuous. The Division takes pride in the fact that the main arteries, like U. S. 10, stay open in all weather.

Snow-Removal Methods

The organization for snow fighting parallels the summer maintenance set-up. A subsidiary headquarters has been established at the city of Glendive, Mont., with crews and extra equipment which may be called at any time, on a 24-hour basis. Scattered through the big eleven-county division are eighteen sections, each under the jurisdiction of a section superintendent. These sections take care of from 26 to 76 miles of road under a patrol system of maintenance.

When snow starts to fall, each section superintendent telephones in to Miles City or Glendive, reporting to C. T. Davis or Bill Brittain, Resident Engineers in charge of maintenance at these two offices. If the storm is routine, extra equipment is held in reserve at the headquarters shops until a section superintendent gets into trouble; then it goes out.

Each member of a snow-fighting crew must have a heavy sheepskin coat,

(Concluded on next page)

MARMACH LOADER Now Available for International Wheel Tractors

The fast, efficient MARMACH LOADER is designed for International wheel tractors. Built for durable, heavy-duty service, it is the economical answer to many tough digging and loading problems.

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Company _____

Improved Alignment Eases Snow Removal

(Continued from preceding page)

heavy gloves, and overshoes or adequate footgear when he starts out. It's a rule. It dates back to the days when men nearly froze to death on open machinery in sub-zero weather. Now the cabs are warmer, and each piece of equipment has a good heater. But the rule still goes.

The Division uses its push plows in tandem for two reasons. First, it is an effective way to get rid of the snow in one pass, all the way out to the edge of shoulders; and second, it is a safe way to operate. Usually the section superintendent takes out one truck-mounted plow, and his helper drives the other.

The first plow makes a pass from the center line of the highway, and the second machine picks up the windrow and throws it off to the side. V-plows are used only if a section has drifted heavily, and the crew needs something heavy to batter through.

If it were not for the howling winds, rotary plows might not be needed here. But where the fall is heavy and the snow piles high, rotaries are used to dispose of the snow far off to the leeward side of the highway. Once a storm begins, men go on 12-hour continuous shifts until the storm and the danger of wind is over.

Curvature on the older highways poses another problem, too—that of ice. Automobile drivers become cautious on the curves. They slow down, apply their brakes. The little bit of snow remaining on the curves then freezes to a sheet of ice, and a death trap is born.

Stockpiles of railroad cinders, furnished with fine cooperation by the Northern Pacific Railroad to any of eight sidings adjacent to U. S. 10, are used to sand the hills and curves. About 50 pounds of calcium chloride per cubic yard of cinders is put in at the time the cinders are unloaded from the cars.

Equipment Is Good

Each section superintendent has his own regular equipment, and can draw on the Miles City or Glendive pool, provided the situation is serious. Down at Broadus in Section No. 7, for example, the superintendent has a 1½-ton International truck with a Bros one-way plow; a 5-ton FWD Model SU truck with a Wausau V-plow and wing; and an Adams motor grader. This section covers 76.3 miles north from the Wyoming state line.

Each of the other districts has its trucks, push plows, and sanding equipment. Reserve equipment at Miles City includes four Ford sanding trucks, an FWD truck with one-way Bros plow and wing, two Snogos, and two heavy V-plows. Reserve equipment at Glendive is about the same, with the exception that two new Galion 102 graders have been assigned to that pool.

Spring Break-Up Serious

During the winter the roads are frozen masses, but in the spring the frost leaves the ground and serious trouble starts. The spring break-up always coincides with the period when heavy loads from oil refineries to the south use the highways of the division. As the loads become more frequent, serious damage results.

Load-limit enforcement follows the statutory regulation of 18,000 pounds per axle. Maintenance men at weighing stations work with the state highway patrol on this. However, it is a preventive, not a cure-all, and the spring break-up is quite severe.

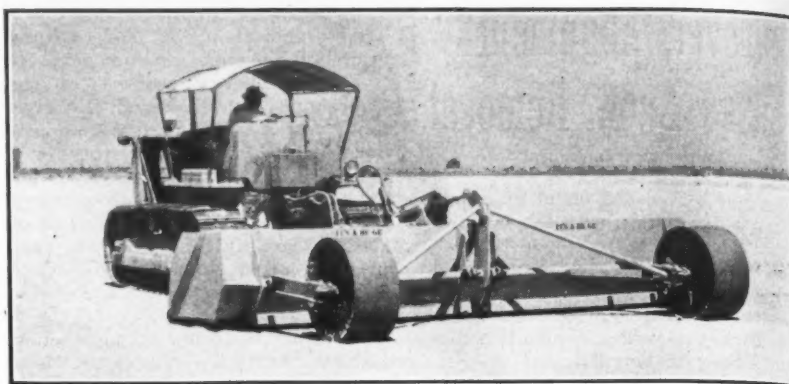
Repairs to this damage consist of filling the holes with sand or gravel, and of blading the unevenness away with motor graders. When the frost is all gone, the places are patched more permanently with bituminous material.

Future Looks Brighter

The future of the highway program in Division 8 is brighter than it has been in years, according to Sanders. New construction will follow more closely the contemporary pattern of well-aligned sound design that prevails in the state and its neighbors. When all highways have finally been built to the proper straight alignment, to the best section that will take full advantage of wind to remove snow instead of putting it on the highways, then and only then will maintenance and snow-removal costs be fully justified.

Wall-Form Information

A set of instructions on how to use its forms for concrete work has been issued by the Irvington Form & Tank Corp., 43 Cedar St., New York, N. Y. Bulletin IF & T deals with the Atlas Speed forms for wall work. All phases of the work are covered in these instructions—from preparations before construction to stripping of the forms



The Bureau of Reclamation has 240,000 acres of desert land in Arizona to be prepared for farming, as part of the Gila Veterans' Project. Here a Caterpillar diesel D8 tractor with a Be-Ge scraper levels in a 100-acre field south of Yuma.

and handling for re-use.

This booklet, in addition to describing each step, shows photographs of the process in operation. It describes erection procedures, shows how to vary the forms for different conditions, how to adjust for varying sizes of walls, and

covers other subjects of concern to those involved in placing concrete forms for buildings, flood walls, service tunnels, foundations, columns, etc.

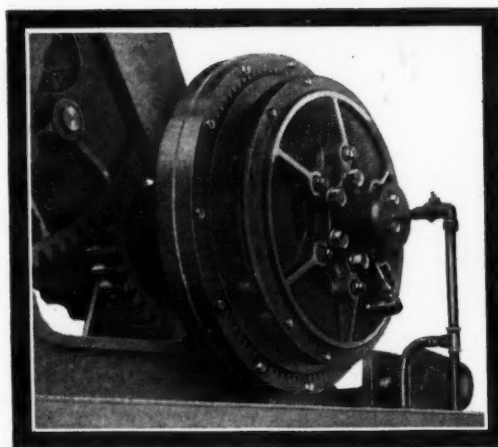
Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 72

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Concreting Is Rushed On Combination Road

Concrete Laid on Outer Lanes Makes Way for Inner Asphalt Surface On New 4-Lane Highway

(Photo on page 1)

A NEW combination-type 4-lane highway, designed to move heavy truck traffic and a high passenger-automobile count at a fast pace, was recently completed between Willard and Brigham, Utah, by W. W. Clyde & Co. of Springfield. It is composed of two outer lanes of portland-cement concrete with 26 feet of hot-mix asphaltic-concrete surfacing in the center. It replaces about 5.5 miles of the existing route of U. S. 91 in three separate locations between those cities.

Financed by Federal-Aid funds and the Utah State Road Commission, the initial construction on this urgently needed road cost \$495,000. U. S. 91 is, at that point, the only north-south main-stem highway for miles on either side. In fact, U. S. 89 and U. S. 30 South both pass along this section.

Begun in August, 1946, the job was hampered by a traffic stream as high as 6,000 vehicles per day, all routed through the job. Dust in the dry season and mud in the wet season both contributed problems which had to be met and solved.

Designed for Hard Use

The new construction follows Utah State Road Commission designs which have worked satisfactorily in the past. Two 11-foot plain-concrete outer lanes 7 inches thick rest on a 2-inch compacted-rock sub-base. The 3-inch asphaltic-concrete plant-mix surface in the center has a 6-inch flexible compacted sub-base. There is a straight 0.2-foot slope from the center line to the outside of concrete pavement to provide for drainage.

Terrain through which the new road passes is largely flat, and the soil contains a great deal of sand and gravel particles. It is well drained, sloping down from the Wasatch Mountains towards the shores of the Great Salt Lake near Ogden.

Frequent heavy truck loads, moving through the intermountain area, will use both the concrete and asphalt lanes. However, heavy slow traffic will use the outer lanes, and the highway is marked to direct all traffic to use the outer lanes except when passing.

Old Highway Rehabilitated

Preparation of a roadbed for the new highway included grading, ripping up the old road in a few spots, and covering it in others. Neither cuts nor fills were extensive, but traffic passing through the job held down the speed of grading equipment. By the end of 1946 the roadbed was 46 per cent complete and the concrete structures 54 per cent complete. Work on the concrete pavement commenced on May 15, 1947, and was completed on July 17.

The passage of traffic over the crushed, screened sub-base undoubtedly had a beneficial effect on the rock, despite the dust annoyance to the motorists. A water truck working steadily to sprinkle this road helped alleviate that condition, however.

Screening Plant Erected

W. W. Clyde & Co. brought in its own rock-crushing and screening plant to produce sub-base rock, concrete aggregates, and mineral filler for the asphaltic-concrete lanes. It processed a thick pocket of alluvium mid-way in the job, and only about 3/8 mile off the right-of-way. The contractor-owned plant is a combination crushing-screening set-up, with a water spray for washing aggregates and a drag washer



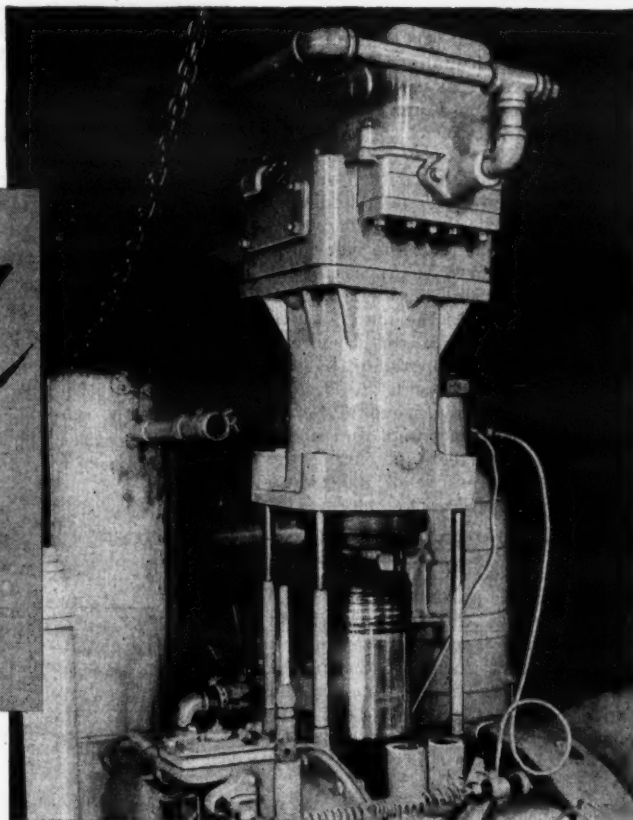
C. & E. M. Photo

This Cedarapids 36 x 10-inch jaw crusher and screening plant was set up by Clyde & Co. to produce sub-base rock, concrete aggregates, and mineral filler for a 4-lane highway job in Utah. The Caterpillar D8 in the background fed material to the trap.

on the sand.

Fed to the trap by a Caterpillar D8 with a Caterpillar bulldozer blade, the

raw material passed by rubber conveyor belt to a 36 x 10-inch Cedarapids (Continued on next page)



At Sinclair Research Laboratories, East Chicago, Ind., skilled technicians specialize in keeping it clean ... for you.

With today's accent on the detergency qualities of engine lubricants, Sinclair Research is constantly making tests to determine the cleansing properties of motor oils, diesel lubricants, and other products, using the special "come-apart" single cylinder diesel engine shown above.

Such tests—duplicating actual operating conditions—constitute an essential part of Sinclair's outstanding research, which has resulted in the development of ever finer petroleum products for over 30 years. At its soon-to-be-completed new Research Center, Harvey, Ill., Sinclair will continue to develop industrial and automotive lubricants of outstanding performance with greater facilities, finer equipment, and more highly skilled personnel than ever before.

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Concreting Is Rushed On Combination Road

(Continued from preceding page)

jaw crusher. A double-deck screen separated the coarse rock and dumped it to the jaw crusher.

There was really so little oversize material in this well graded deposit that it was an "easy" pit for the crusher. Nearly 75 per cent of the material met the gradation requirements without further crushing, and could be passed on through the plant. When the material left the primary crusher, it went by conveyor to the secondary Cedarapids unit, where water under high pressure sprayed the material as it passed over a set of screens.

Sand was classified and washed, then dragged out to a storage hopper. Transfer hoppers between the plant and the fleet of haul trucks were set up for sand and two sizes of rock. There was a predominance of the intermediate sizes of rock between $\frac{3}{8}$ and $\frac{3}{4}$ inch, so some of this material was stockpiled for later use in the bituminous mix.

When CONTRACTORS AND ENGINEERS MONTHLY's Western Editor visited the project, sand and two sizes of rock were being produced for concrete aggregates. As fast as the plant could turn out the graded stone, a 4-truck fleet hauled it off to the batch plant. A change of screens was planned for the week following, in order to start processing the bituminous-mix mineral.

Water for washing the material was situated close by in a small running stream, dammed temporarily by the D8 to make a deep pond. A Wagner 40-hp electric motor drove a 4-inch Advance centrifugal pump, and about 160 feet of 4-inch steel pipe carried the water under a pressure of 120 psi up to the spray nozzles above the screens.

Preliminary Work Paces Pour

With about 8,000 linear feet of war-surplus Blaw-Knox steel forms, 8 and 9 inches wide, on the job, the initial crews had little trouble in staying out about 1,300 feet ahead of the paver. With all the grade recently finished and in good condition generally, the only preparation work for forms consisted in excavating a small trench in which they were set. A Caterpillar No. 12 motor grader dug this trench by means of a 24-inch cutting blade fastened to the moldboard of its conventional blade.

A crew of 18 men set forms ahead of the pour. Five men brought forms ahead from the previous day's pour. Three men hand-finished the form, trench with shovels to give the form bases solid, level ground on which to rest. Ten men set the forms according to stakes furnished by the State Highway Department surveyors. These stakes, set every 50 feet, gave the exact elevation of the top of forms, and alignment. They were offset about 2 feet



C. & E. M. Photo

At the W. W. Clyde & Co. batch plant, an empty batch truck drives under the bins. At the left, bulk cement is being unloaded and stored. And in the far background, a D4-mounted bulldozer keeps the batch plant supplied.

from line to give the men a little working room.

The forms were sprayed just ahead of the paver, by one man who used an orchard-type spray and diesel fuel.

After the forms were set and staked down, a Caterpillar No. 12 motor grader

and a shop-made fine-grade planer worked the grade to its exact elevation. This work was governed by the original work Clyde did on the preparation of subgrade. When the subgrade was prepared, the 2-inch rock cushion was put in. The shop-made planer, drawn

by a Case tractor, smoothed the rock cushion down behind the motor grader.

Fine-grade was built as close to grade as possible, leaving no possibility of concrete pavement less than the full 7 inches in thickness. Tight string lines stretched over the top of the forms were checked at several points to make certain none of the subgrade was high. Also, yield checks were made on concrete, and bag checks made on the cement supply each day.

The finished, checked fine-grade was rolled down tight as it was spread. An 8-ton Galion tandem roller was used for this work. The sub-base was not sprinkled immediately, but was attended to just ahead of the paver.

Expansion joints, required every 90 feet, also had to be set in place ahead of the pour. The $\frac{3}{4}$ -inch round steel dowels, 11 to a frame, came to the job prefabricated, with the dowels welded to steel cross bars. After these prefabricated assemblies arrived on the job, the ends of the 24-inch dowel bars

(Continued on next page)

From Contractors & Engineers Monthly for July, 1947

Compaction of Soils Is Conference Subject

ARBA-Sponsored Two-Day Session
At Buffalo Covers Practical Methods
And Equipment for Soil Compaction:
Vibration Is New Development

SOIL compaction and the equipment with which to secure it in embankments, fills, and subgrades were discussed at a recent conference in Buffalo, N. Y. The two-day meeting was sponsored by the American Road Builders' Association Committee on Compaction of Soils, and the Soils Section of the Joint Committee on Development of Highway Construction Equipment of the Highway Research Board and the ARBA. It was attended by 86 highway engineers, contractors, and equipment manufacturers.

Most interesting of the various subjects discussed were the new developments in soil compaction equipment.

BREAK PAVEMENT TAMP BACKFILL The Low-Cost Way!

Compaction of soils has long been a source of grief and controversy among contractors and engineers.

RAPID PAVEMENT BREAKER MACHINES

have proved to be an answer to better compaction at a lower cost!

FASTER because three-foot layers can be tamped at one time.

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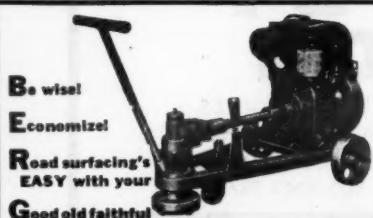
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were greased and capped with a tin sleeve. Dowel bars were set 3½ inches above the sub-base, and 6 inches from the steel forms.

Each dowel passes through a hole which pierces the 1-inch mastic expansion material. Mastic came to the job in strips 7 inches wide x 10 feet long, and a 12-inch strip had to be joined to the conventional length to make the full joint in the 11-foot concrete slab. After the mastic material was on, it was held in position by a steel cap, staked to the ground until after the pour. "Spider" steel reinforcement at the joint was also placed after the dowel and mastic assembly had been set.

Batching the Concrete

Supplied entirely by truck, the batch plant was accessible to all the job on a 3½-mile haul, and was only about ¾ mile away from the sand and rock supply. The batch plant was manufactured several years ago by the Lang Co. of Salt Lake City for W. W. Clyde & Co. It has 20-ton bins for sand, and large and small aggregate.

Sand and the two sizes of rock were handled by a Caterpillar D4-mounted bulldozer, which pushed each size of material from the truck dump to a feeder hopper. A motor-driven conveyor belt moved the aggregates up to the weigh bins. The same operator who weighed the batches operated the motor and kept his weigh bins full.

When a 3-batch truck drove under the plant, it headed in. The operator dropped three 1,100-pound batches of 1½-inch-maximum rock in the bottom of the three compartments. While the truck moved ahead about 30 feet to the cement platform, the operator was busy weighing the first batch of sand and pea gravel. Seven sacks of Union portland cement were unloaded in each compartment on top of the rock. Then the truck backed up under the batch plant, and three batches were dumped in on the cement. They were dumped in a single slug, containing 1,300 pounds of sand and 1,300 pounds of pea gravel per batch.

Bag cement was used, delivered in five big transport trucks from Devils Slide, Utah. Two of these trucks were new International K-8's, and most of the batch trucks were K-7's. Project Superintendent Harry Clyde, one of the partners, explained that W. W. Clyde & Co. is trying to standardize on Internationals as much as possible.

As the cement arrived, a crew unloaded and stacked it on a platform near the batch plant. During batching hours, the sacks were opened by three men, and transferred to the batch-truck compartments by Insley concrete buggies, each of which held seven sacks of cement. The drive-through loading ramp underneath the batch plant and cement platform let each truck go on through after it picked up its load, and saved considerable time over the method where the hauling vehicle must drive up to the cement plant, turn around, and back in.

Mixing the Concrete

Clyde & Co. did the concrete paving of this job with a MultiFoote 27-E paver, with a single drum and a 30-foot boom. A veteran of quite a few good-sized jobs, it was spotted just outside

the form lines on the highway shoulder.

Trucks were controlled by a spotter. He directed them as they backed in to the paver skip and dumped each batch. Sandwiched between aggregates, the cement had no chance to stick to the truck bed or the steel skip. If a wet batch showed any tendency to stick to the skip, it could always be dislodged by jiggling the paver-skip control cable.

Mixing water came from the Perry municipal supply, hauled by three Ford trucks with 1,200-gallon tanks. Two trucks serviced the MultiFoote paver. Each one pulled up behind the paver and tied a little 2-inch pump on to its rear axle. This pump, driven by a Wisconsin gasoline engine, then transferred the water from the truck tank to the paver. About 160 feet of flexible hose was carried along with the paver, but as it moved ahead the trucks did the same.

Mixing time was one minute, and the average placing slump was about 2½ inches. Vinsol resin air-entraining agent was used to increase the work-

ability of the concrete, and to produce better resistance to ground conditions.

Concrete from the paver was dumped on the subgrade, usually in a ribbon beginning at the side farthest from the operator, and working towards him. The 7-inch concrete slab is not reinforced, except for the few bars at expansion joints, so the placing crew was not a large one—only two puddlers who worked with the finisher.

The Blaw-Knox double-screed finishing machine leveled the top of the concrete and carried any excess material on ahead by means of steel wings on the lead finishing screed. With the exception of hand shoveling of concrete in close to the forms, there was no special treatment of concrete at that point.

Concrete Finishing

After the Blaw-Knox machine backed up and made a second pass over the concrete, the surface was ready to be finished. Two men, each standing on a wood bridge, screeded the concrete horizontally with a shop-made timber



C. & E. M. Photo
As a foreman with his back to the camera checks on alignment, workers stake Blaw-Knox forms to the grade with steel pins. About 8,000 linear feet of these forms were on the job.

device with plow handles on each end. Before they moved their bridges on ahead, they picked up and set in place a ¼ x 2-inch steel wedge every 15 feet
(Concluded on next page)

25 TON CAPACITY LOW BED TRAILER



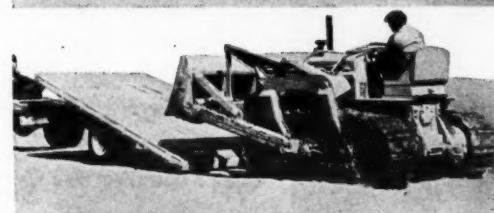


SPECIFICATIONS

Length, Overall—30' 2" Length, Front of Drop—8' 2" Length, Back of Drop—22' 0" Length of Bed, Front of Tires to Back of Drop—15' 6" Height of Bed—31" Width, Overall—8' 0" Axle Spacing—40" Kingpin—Heavy Duty Standard, Interchangeable. Axles—Heavy Duty Tandem, 5" Tubular.	Brakes—12½" x 5½", Two Shoe, Air Operated. Brake Chambers—Individual, each Wheel. Wheels—Heavy Duty Cast Spoke type, 15" diameter. Rims—15.00 x 5.50. Tires (8)—8.25 x 15, 12 Ply. Floor—2" Hardwood Planking, laid crosswise and bolted. Skid Rails—Sides and rear. Lights—I.C.C. Regulation. Paint—Highway Yellow.
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● For safe and speedy job-to-job transport of all types of bulky and extra heavy machinery and equipment, GRAMM now offers this heavy duty low bed trailer. Of all steel—all welded construction with extra thick hardwood platform; it's ruggedly built—in the true GRAMM tradition—for long, dependable, and economical service. Designed for fast, efficient loading from sides or rear. Solve your heavy equipment transport problems now with the GRAMM low bed trailer.

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Concreting Is Rushed On Combination Road

(Continued from preceding page)

to form the dummy contraction joints in the pavement.

A finisher working with a long-handled wood bullfloat then gave the slab its preliminary finish before the concrete had taken its preliminary set. Two finishers touched up the edge of each contraction joint with $\frac{1}{2}$ -inch-radius edging tools, and also dressed the sides along the form edges.

The final finish, applied when the concrete surface had set just enough to stand it, was given with a stiff-haired 24-inch warehouse broom, stroked across the slab at right angles to the center line. The dummy-joint irons and the expansion mastic caps were not removed until after the concrete had set up well beyond the preliminary stage. Dummy irons were loosened, however.

The concrete was cured by laying Army-surplus tarpaulins 40 x 15 feet lengthwise on the slab, weighting them with form pins or anything else that would keep the wind from blowing them loose, and letting them remain in place four days. The forms were taken off the day following the pour, however, and moved ahead. They were cleaned by steel hoes or shovels before again being placed in line for a pour.

Personnel

The job was run for W. W. Clyde & Co. by Harry Clyde, one of the three Clyde brothers, with Ora L. Hyer in charge of paving. Fred Miles was the Resident Engineer for the Utah State Road Commission. Designed under the supervision of Roy W. McLeese, Chief Engineer, the project was also under his general direction through Construction Engineer R. W. Griffin.

Rock Bits Serviced

A special rock-bit sharpening and reconditioning service is available to contractors in the New England area from the plant of the W. J. Dunn Co., Inc., 524 C St., Boston, Mass. Features claimed for the Dunn hot-milled retempered rock bits include faster drilling speed, longer life, minimum gage loss, and lower drilling costs.

According to Dunn, each bit is re-hardened after sharpening. This is said to assure new-bit performance on each run. Furthermore, mushroomed or cracked bits are said to be entirely eliminated. Another result of hardening is that the amount of wear is kept to a minimum.

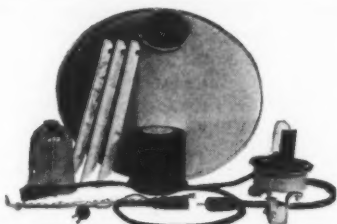
Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 32.

Airport-Lighting Kit

A compact airport-lighting package has been announced jointly by the American Gas Accumulator Co., 1030 Newark Ave., Elizabeth 3, N. J., and the Lighting Division of the General Electric Co., Schenectady 5, N. Y. Built to CAA specifications, it is designed for lighting runways from 1,800 to 7,000 feet long.

Runway, taxiway, and threshold lights are of the elevated type. They take 30 to 45-watt 6.6-amp standard runway-lighting lamps, and are housed in prismatic lenses said to throw light beams up and down the runway. The main beams provide, according to the manufacturer, more than 1,000 candlepower of light. The lights are mounted on lightweight cones secured to the ground above the insulating transformer by a staking method said to be unique. The lamp circuit is plugged into the secondary lead of the insulating transformer.

The kit consists of Type IL insulating transformers, control cabinet, direct-



This photograph shows the disassembled component parts of an airport-lighting package jointly announced by the American Gas Accumulator Co. and the General Electric Co. It is designed for runways 1,800 to 7,000 feet long.

burial-type cables, elevated runway markers, and lights. The control cabinet contains a constant-current regulator, runway-brightness and selector controls, and protector relays. All connections are made through waterproof molded-rubber plugs; this eliminates the need for splicing or soldering. The transformers have a coil and core arrangement sealed in a compound for direct burial in the earth. The Versatol-geoprene cable is designed to carry

up to 600 volts.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 29.

Grease Flow Properties Are Discussed in Article

The December issue of "Lubrication", company magazine of The Texas Co., 135 E. 42nd St., New York 17, N. Y., is devoted to an article on "Flow Properties of Lubricating Greases—Relationship of Apparent Viscosity". Interest has long centered on the possibilities of predicting the properties of lubricating greases from measurements giving results in fundamental rather than arbitrary units. A determination of flow characteristics would be a step in this direction. Because greases are semi-solid or plastic materials, they do not flow like true liquids, and their flow properties are therefore difficult to measure.

The article points out that with the advent of the pressure viscosimeter,

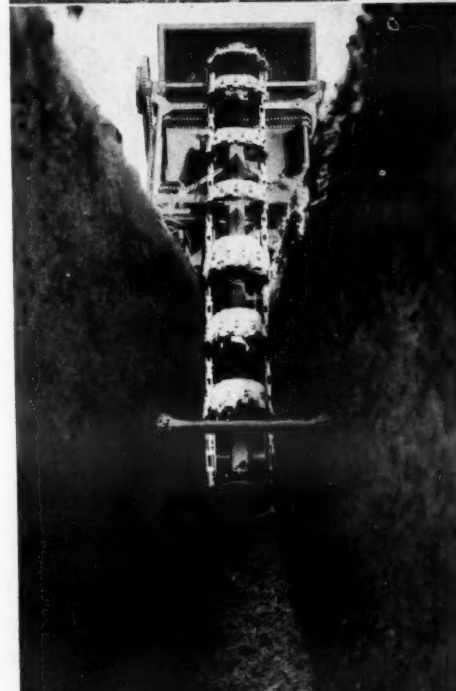
fundamental measurements in terms of apparent viscosities have been made on greases. It describes laboratory work which has attempted to relate apparent viscosity to low-temperature torque, low-temperature consistency, and the dispensing characteristics of lubricating greases. The investigation points to the interesting possibilities of using apparent-viscosity determinations of greases to predict low-temperature pumpability, and to make a more intelligent selection of greases to be handled in a given field-dispensing system of lubrication.

The article discusses the equipment for measuring apparent viscosity, the principle of the pressure viscosimeter, low-temperature torque measurements, relation of apparent viscosity to low-temperature torque, relation of apparent viscosity to penetration, and relation of apparent viscosity to pumpability.

Copies of this article may be obtained from the company. Or use the enclosed Request Card. Circle No. 1.

How PARSONS TRENCHLINER ELIMINATES COSTLY HANDWORK

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Trench Next to Walls Without Hand Work

Parsons Trenchliner digs at top efficiency within just a few inches of walls, fences, telephone poles. Boom shifts across entire width of Trenchliner — easily and smoothly, because it rides on large diameter rollers. Shifting boom permits Trenchliner to sidestep obstructions that stop other trenchers, saves money on sections of trench that formerly were 100% costly hand work.

Pipe Across Trench Is No Problem

Trenchliner digs up to pipe, then over, then slides boom under pipe. Hand work is virtually eliminated.

Clean Bottom, Straight Walls

Trenchliner ditches are uniform, the width you need at the depth you want, straight-walled, round-bottomed, ready for pipe with minimum hand work.

PARSONS COMPANY

Newton, Iowa • Koehring Subsidiary

Crushing, Screening Plant Semi-Portable

A semi-portable crushing and screening plant has been announced by the Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn. It is designed to produce two sizes of aggregate and sand. This Model No. 55 plant consists of a jaw crusher, bucket elevator, and transfer conveyor, all mounted on a 4-wheel trailer. The revolving screen is a complete unit mounted on either steel or wood bins.

Capacity of the plant depends upon the size of aggregate required and the size of the jaw crusher. Using the Model No. 1016 crusher, the capacity at a 1½-inch setting is listed at from 10 to 15 tons per hour. With the Model No. 1024 crusher, this listing is raised to 15 to 25 tons per hour. Weight of the plant with the No. 1016 jaw crusher, and bin, is approximately 26,000 pounds. A 20-cubic-yard 3-compartment bin is included with the plant when specified. A gasoline or diesel power unit de-



The new Pioneer No. 55 crushing and screening plant produces two sizes of aggregate and sand. The jaw crusher, bucket elevator, and transfer conveyor are all mounted on a 4-wheel trailer. The revolving screen is a complete unit which mounts on a steel or wooden bin.

livering 50 continuous horsepower is mounted between the crusher and bucket elevator. The plant includes multiple V-belt drive from power unit

to jaw crusher; drives from crusher to the elevator and revolving screen; and the necessary hoppers and spouts for operation of the plant. In transit, the bucket elevator folds back over the truck, reducing travel height to 11 feet 6 inches. A winch and crank raise and lower the elevator.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 6.

Caterpillar Army Units

An agreement to sponsor two units in the recently established Army Affiliation Program has been signed by the Caterpillar Tractor Co. One company has been designated as Headquarters and Headquarters Company, Engineer Base Depot, and will be concerned with training in top-level planning for serving 100,000 troops. The other company, an Engineer Base Equipment Company, will be trained in the methods of receiving materials on the basis of an overseas operation.

Highway Exposition Proves Huge Success

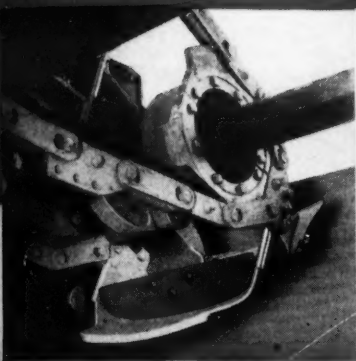
The first post-war New England Highway Exposition, held October 14-16, was a complete success. More than 10,000 visitors attended. Traveling to Boston from all the New England states and New York and New Jersey, they were presented with an abundant display of construction equipment: tractors, bulldozers, shovels, cranes, mixers, compressors, crushers, a wide variety of safety and traffic devices, and manual and electric tools for construction and repair work on highways. It was estimated that more than \$3,500,000 worth of goods was on display.

Visitors to the exposition consisted primarily of contractors, public-works officials, mayors, selectmen, state, city, and town engineers, and planners and builders. One of the principal attractions was a rotary traffic circle complete with granite curbing and flagstone walks converging upon a 10-ton granite flagpole base—all constructed over the weekend before the show.

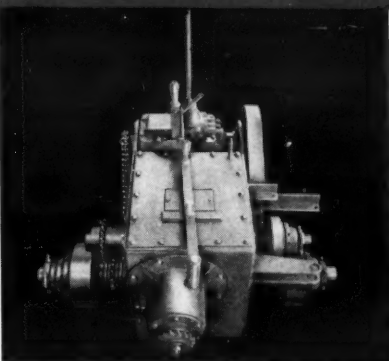
Speakers at the opening ceremonies included Governor Robert F. Bradford of Massachusetts; Michael T. Kelleher, President, Boston Chamber of Commerce; William T. Morrissey, Chairman, Metropolitan District Commission; William H. Buracher, Chairman, State Department of Public Works; and Edgar T. Coppel, President, American Safety Councils. Daniel G. Lacy, Superintendent of Streets, Brookline, Mass., acted as Master of Ceremonies.

Speakers paid tribute to the committee for the all-out and progressive manner in which it had handled the exposition. They pointed out that the aim of the sponsors and co-sponsors, numbering 30 organizations—to direct attention to the means of upbuilding highway systems in the New England area—was in itself most worthwhile. The show was under the management of the Campbell-Fairbanks Expositions, Inc., of Boston and New York.

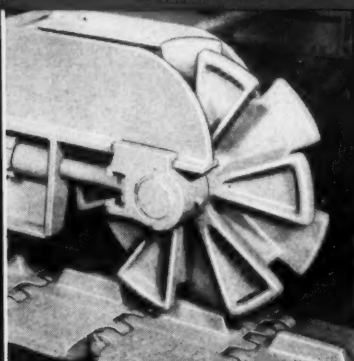
Eliminates Costly Maintenance Hand Work



SELF-CLEANING BUCKETS—No hand work. Buckets are scraped out automatically by spring-cushioned cleaner. Each bucket gets a big bite . . . all pay dirt . . . because bucket is always clean.



OIL CHANGED ONLY TWICE A YEAR—Even under continuous operation. All gears activating operations of Parsons Trenchers enclosed in one oil-tight case, in continuous oil bath.



PROTECTED AGAINST ABRASIVE WEAR—Entire crawler assembly is self-cleaning. Main machinery is well shielded from bucket line spill . . . stays clean . . . moving parts throughout are protected.

**Full Batch
Discharged in
7 Seconds**

**Top Capacity
plus
Full Portability**

**Enclosed Gears
Run in
Continuous Oil Bath**

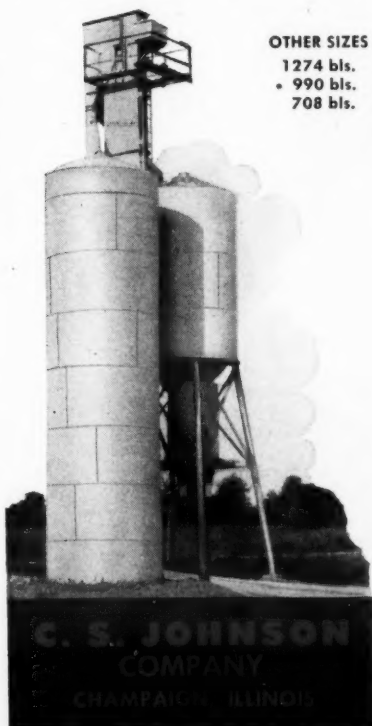


Kwik-Mix Dandie Concrete Mixers

Tilted Flow-Line Discharge Chute, exclusive on the Kwik-Mix Dandie line of concrete mixers, reaches deeper into the drum, intercepts tumbling concrete at just the right angle to maintain natural flow-line in discharge. Kwik-Mix Dandie mixers are available in the following sizes: 3½-S, 6-S, 11-S, 16-S.

Johnson Twin-Silo Bulk Cement Plant

Johnson Twin Silo bulk cement plant, stores as much as 1550 barrels of cement, yet is fully portable. Welded construction speeds erection.



OTHER SIZES
1274 bls.
990 bls.
708 bls.



Koehring 304 Heavy-Duty Pullshovel

Heavy-Duty leader in the ¾ yard class. An excellent tool for the trenching jobs where wide sloped trenches are required or where nature of material to be excavated calls for shovel digging. Maintenance time cut in half, because all gears are enclosed, run in continuous oil bath. Anti-friction bearings require lubrication only twice a year.

Protected by Canvas

"Protected by canvas" can mean many things to a contractor. For there are many ways in which specially processed canvas can serve his needs. To mention a few: flameproof canvas can be used to protect welding booths; mildew-proof canvas will protect stockpiled materials; and weather-resistant and water-repellent canvas can be used to protect materials on trucks and in stockpiles, at cement docks, and for similar uses.

The Philadelphia Textile Finishers, Inc., of Norristown, Pa., has developed a process which is said to provide canvas with all four of these characteristics. Flamefoil canvas can be furnished in various sizes and to meet various needs. But all canvas which bears the Flamefoil mark, will, according to the manufacturer, be flameproof, mildew-proof, weather-resistant, and water-repellent.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 30.

Data on Oil-Filter Line

A folder on its line of oil filters has been issued by the W. G. B. Oil Clarifier, Inc., Kingston, N. Y. These filters are made for use with gasoline or diesel engines in all sizes. Feature of the line is the W. G. B. replacement filter cartridges.

Models described in this bulletin include the C, T, S, CT, and fuel-oil clarifiers. They range in capacity from 75 to 187 cubic inches. The folder describes the operating features of each model, the sizes in which it is made, dimensions, and engines for which it is recommended.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 88.

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COMPANY**
WASHINGTON, WISCONSIN

**C. S. JOHNSON
COMPANY**
CHAMPAIGN, ILLINOIS

**KOEHRING
COMPANY**
MILWAUKEE 10, WISCONSIN

Field-Practice Data For Civil Engineers

A volume called "Field Practice", designed to equip the field engineer or inspector for inspection of virtually any line of civil-engineering work, has been published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. This book is Volume III in the series "Data Book for Civil Engineers". It was written by Elwyn E. Seelye, partner in the New York City firm of Seelye, Stevenson & Value, consulting engineers.

It contains outlines of inspection procedures, and check lists on concrete, masonry, structural steel, welding, bridges, foundations, pile driving, timber, soils, grading, bituminous paving, sanitary construction, and pipe laying. It also contains material on the conducting of field tests, as well as necessary data tables and report forms.

Surveying, which the author feels is one of the most fundamental requirements in civil engineering, is covered

in detail. There are stadia-reduction tables, stake-out problems, curve data, railroad-turnout data, earth-work tables, transit and level problems, azimuth determination, isogonic charts, instrument adjustments, tape data, plotting problems, mapping symbols, tables of measure, trigonometric tables, and trigonometric functions.

The publisher believes that the three volumes of the Seelye "Data Book for Civil Engineers" constitute a concise, complete, and useful single reference work covering all phases of construction. The first volume in the series, "Design", sells for \$7.50; "Specifications and Costs", the second volume, \$6.75; and "Field Practice", \$4.50.

Illinois Dealer for Carter

The O. T. Christerson Co., has been appointed an exclusive agent for the Ralph B. Carter Co., Hackensack, N. J. The Christerson Co., will handle the complete Humdinger line of self-priming centrifugal pumps and the Carter

single and double diaphragm units. Located at 3900 So. Wabash Ave., Chicago, Ill., the company will cover the northern Illinois territory, including Chicago.

Highway Research Board Publishes Meeting Report

Papers and reports presented at its 26th Annual Meeting have been published in book form by the Highway Research Board of the National Research Council. This 618-page volume contains the complete proceedings.

The papers are presented in six groups according to the six departments of the Board: economic, finance, and administration; design; materials and construction; maintenance; traffic and operations; and soils investigations. Minutes of the business meeting, table of contents, and authors' index are included.

Copies of this book can be obtained from the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C., at a price of \$7.50 per copy.

1947 DECEMBER 1947

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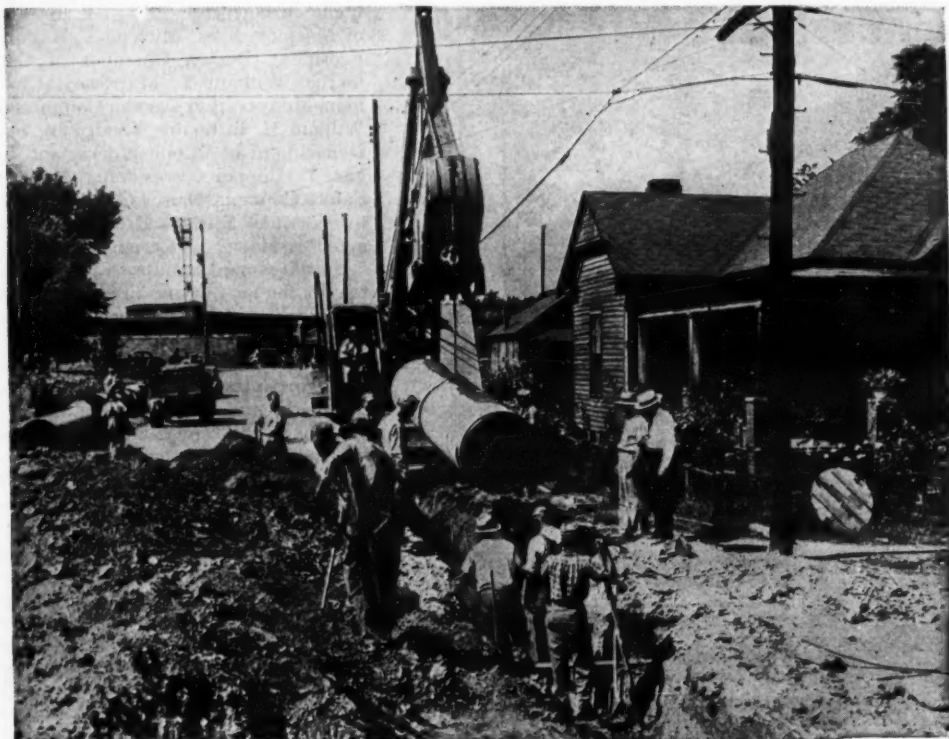
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1948 FEBRUARY 1948

SUN	MON	TUE	WED	THUR	FRI	SAT
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8	9	10	11	12	13	14

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Time for
TARPS!!**



Stein Construction Co., Chattanooga, laying a 30" water pipe with a Bay City Model 45 Hoe.

SPEEDY BAY CITY HOE IS EVERY INCH A MONEY-MAKER IN LAYING A MILE OF PIPE

If you want power, snappy action, and versatility in your material handling, you'll do well to let a Bay City handle the job. For example, a Model 45 like the one being used by Stein Construction Co. of Chattanooga to lay a mile of 30" concrete pipe for the city water supply. This ¾ yard Bay City is excavating a trench 5,800 ft. long, and with a cable and hook is laying pipe.

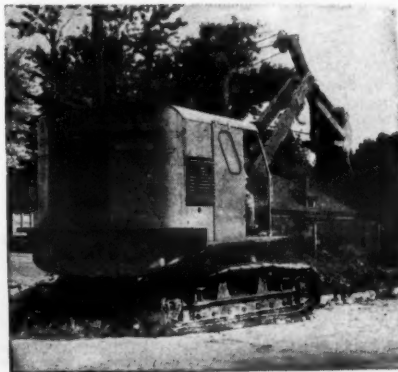
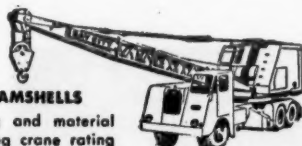
The Model 45 Hoe is available with a bucket 24", 30", 36", or 40" wide to take care of all your excavating and material handling problems quickly and profitably. For full particulars, see your nearest Bay City dealer or write direct.

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SEE YOUR NEAREST DEALER for Bay City excavating and material handling equipment in sizes from ¾ to 1½ yards having crane rating up to 20 tons. Both crawler and pneumatic tire mounting.

BAY CITY SHOVELS, INC., Bay City, Michigan



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TARPAULIN**
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Plant-Mix Widens And Surfaces Road

Continuous Mixer Has Two Driers for Heating Stone Aggregate; Surfacing Is Placed During Winter

A 5.3-MILE section of U. S. 78 or State Route 10, Georgia's Stone Mountain Memorial Highway, has been improved between Avondale and Stone Mountain, northeast of Atlanta. The old 20-foot road had a 6-inch broken-stone base course on which had been placed a 2-inch surface-treated mat. In the recent reconstruction, a 2-foot widening strip of bituminous concrete was added on each side; then the full 24-foot width was covered with two courses of plant-mix.

The State Highway Department of Georgia got the De Kalb County job under way last December. At that time W. C. Shepherd Co., Inc., of Atlanta, having been awarded a \$98,974 contract, began widening operations. Despite the cold winter which hampered the bituminous work, the highway reconstruction was completed by the end of March. The shoulder seeding was deferred until April or May.

Road Widening

By using machines specially adapted for widening projects, the contractor was equipped to do a mile of widening per day. But because of the cold weather this production was not consistently maintained. In all plant-mix work, the temperature had to register 40 degrees and be on the rise before work was permitted, according to the specifications. As a result only a few full days of work were possible at that time of the year, and naturally no production records were possible.

For excavating the widening trench, 6 inches deep x 2 feet wide, a Caterpillar No. 11 motor grader was fitted out with a special drop blade, 6 inches deep x 3 feet long. When the blade was set at a certain angle it cut the trench to the required width and depth.

The trench was then filled with plant-mix put down in two layers by an Apsco No. 60 spreader. The adjustable spreader box was set for the required 2-foot width. A Galion 3-wheel 1XB trench roller compacted the initial layer to 3 inches before the upper lift was added. As the second 3-inch layer came flush with the top of the old pavement, the regular black-top tandem rollers were used for compaction.

Before any leveling or binder course was laid, half the width of the road, including the widening lane, was given an application of RC-2 asphalt at the rate of 0.1 gallon to the square yard. This tack coat was shot from a 12-foot spray bar on a Kinney 1,250-gallon distributor mounted on a Mack truck. The bitumen was applied in the late afternoon at a temperature of 125 degrees F. That half of the road was then closed to traffic and the following morning the first course of plant-mix was laid over the tacking.



Jobs Done Quicker, Cheaper

Attached to Tractors, Bulldozers, Motor Graders and Scrapers, the Automatic Slope-Meters are in use on the construction of highways, airports, dams and building sites. Slope-Meters are compact, sturdily constructed instruments that will automatically show the operator the exact grade or slope on which he is working.

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WM. H. ZIEGLER CO., INC.

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C. & E. M. Photo

A Barber-Greene bucket loader powered by a Buda gas engine at the Shepherd Co. asphalt-plant stockpile delivers aggregate to a Ford truck.

Three Plant-Mix Courses

In many places the old road was so rough and uneven that a leveling course

was first laid to smooth out the grade. This amounted to as much as 6 to 8 inches in certain locations. The level-

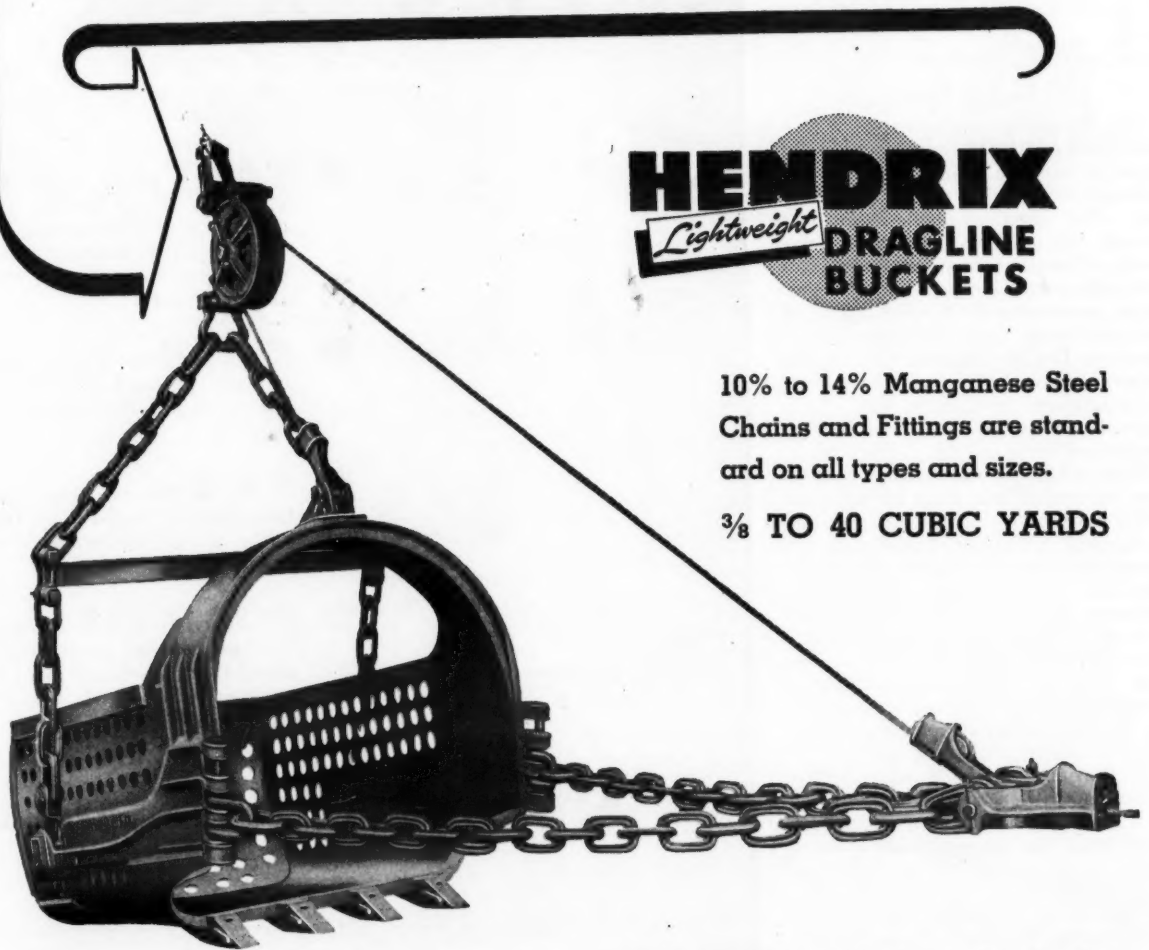
ing was put down in layers not exceeding 3 inches.

A Barber-Greene Finisher laid all the plant-mix. On top of the leveling course, or directly on the old pavement when the leveling was not necessary, the Finisher laid a binder course which compacted to a 1½-inch thickness under rolling. The binder course took about 150 pounds of material to the square yard. This was followed by a wearing or surface course averaging 100 pounds to the square yard; it was rolled to a 1-inch thickness.

The usual procedure with the binder and top courses was to lay a 12-foot strip down one side of the road in the morning, and then move the Finisher back to the starting point and complete the remaining half in the afternoon. After a few days' work with the binder course, this portion of the road was then topped with the surface course. All three courses were rolled by two tandem rollers—a 5 to 7-ton Buffalo-Springfield and a 7 to 10-ton Galion.

(Continued on next page)

EVERYTHING THAT COULD BE ASKED FOR IN A ⅜ TO 40 CUBIC YARD BUCKET



HENDRIX
Lightweight **DRAGLINE BUCKETS**

10% to 14% Manganese Steel Chains and Fittings are standard on all types and sizes.

⅜ TO 40 CUBIC YARDS

3 TYPES DESIGNED FOR EVERY DIGGING CONDITION

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- ★ 20% to 40% lighter than other buckets, type for type.
- ★ All welded construction for greater strength and durability.
- ★ Manganese Steel Chains, Fittings, and Reversible Tooth Points.
- ★ Full Pay Load every trip, even in wet digging.
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C. & E. M. Photo

The black-top for the widening and surfacing contract on U.S. 78 in Georgia was mixed in this Barber-Greene HD-848 continuous-mixing plant. The hopper is at the left, the dust collectors at the right.

Plant-Mix Widens And Surfaces Road

(Continued from preceding page)

The mix was practically the same for the trench widening, leveling, and binder courses, but it had a finer gradation for the top course. Typical sample gradations of the two courses are as follows:

Sieve Size	Per Cent Passing Binder	Top
1-inch	100	...
3/4-inch	100	...
1/2-inch	63	100
3/8-inch	...	100
No. 4	29	70
No. 10	24	48
No. 40	...	25
No. 80	...	13
No. 200	...	5
Asphalt, AC-8	4.5 per cent	7 per cent

Asphalt Plant

The black-top was mixed in a Barber-Greene HD-848 continuous-mixing plant set up on a siding of the Georgia railroad in Avondale at one end of the job. The area available was long enough but quite narrow, since it was confined between the tracks on one side and a steep bank on the other. Crushed stone comprising the coarse aggregate was purchased from the Consolidated Quarries Co. at Lithonia, Ga. Stone screenings for the fine aggregate came from quarries at Camak, Ga. They were shipped by rail 20 and 125 miles respectively.

When shipment was made in gondola cars, unloading was done by a Lorain 40 Moto-Crane with a 40-foot boom and a 3/4-yard clamshell bucket. When hopper-bottom cars carried the material, they were unloaded by a Burch unloader, the belt of which is 24 inches x 30 feet. Because of the restricted width, the stockpiles could not be very large in area. This meant that several different piles had to be established, and the material had to be rehandled to get it to the pile adjoining the plant.

A Barber-Greene 25-foot bucket loader on crawler treads, and powered by a Buda gas engine, loaded the material from the far piles into a truck which dumped it a few hundred feet away at the plant pile. A Caterpillar D7 tractor-dozers worked around the piles keeping the material heaped up so as to occupy as little space as possible.

The dozer also pushed the material to the Moto-Crane which charged the 2-compartment 25-ton aggregate bin at

one end of the plant. A feeder at the bottom of the discharge hopper on the bin regulated the flow of stone and screenings to the 25-foot cold elevator which served the twin driers. The parallel driers were 31 feet long x 5 feet in diameter, and were heated by a

Hauck torch from the low or exit end. From the top of the high or entrance end of each drier a 24-inch-diameter duct carried the fines, smoke, and fumes to two dust collectors at the side of the plant. The material was sucked through by Clarage 3-foot-diameter exhaust fans pulling from the far end of each tube. The fans were driven by a Buda HP-351 gas engine. In the dust collectors the fines settled to the bottom. From there they were chuted down to the foot of the hot elevator, while the smoke and fumes were released through two 30-foot chimneys.

The heated aggregate and fines were then raised on a 30-foot enclosed hot elevator into which the driers emptied. From the top of this elevator the material dropped into a 10-ton hopper from which it flowed under positive control onto a 12-foot-long apron feeder. The feeder in turn carried it along to the mixer box or pugmill.

Bitumen Handling

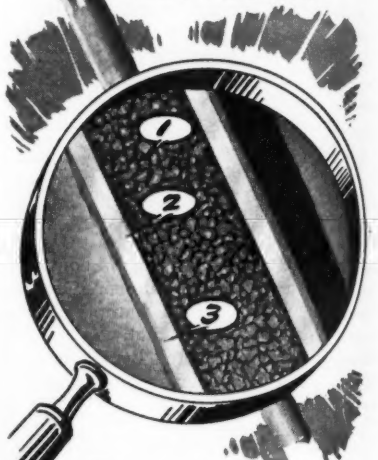
Asphalt for the project was purchased

from the Placid Oil Co. at Tuscaloosa, Ala., and shipped 300 miles in tank cars to the sidings. The AC-8 was heated in the cars by the plant boiler, an oil-burning Lucey unit equipped with a Hauck torch and rated at 125 hp. When the asphalt in the cars was heated it was pumped out to two 11,000-gallon

(Concluded on next page)

Better Weldability • High Build-Ups • Rapid Deposition Rate

Stoody Manganese ELECTRODES



① MANGANESE-NICKEL ALLOY

② MILD STEEL TUBE

③ SPECIAL COATING FOR SMOOTH, STABLE ARC

Stoody Manganese is a fabricated electrode having a mild steel tube filled with ferro-manganese and nickel particles. This special manufacturing process reduces electrode cost, provides better weldability and assures deposits having full Hadfield properties.

Besides lower cost you get these desirable features:

- ✓ Smooth Stable Arc
- ✓ Rapid Burn-Off Rate
- ✓ Low Penetration
- ✓ High Build-Up
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- ✓ Easy Slag Removal
- ✓ AC-DC Application

Stoody Manganese is available in 1/4", 3/16" and 5/32" rod diameters; coated for AC-DC application, bare for DC only. Try 50 lbs. today! Sold by over 600 conveniently located Stoody distributors.

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1136 WEST SLAUSON AVE., WHITTIER, CALIF.

STOODY HARD-FACING ALLOYS
Retard Wear • Save Repair

Cutting WIRE ROPE is easy

FAST Specially designed cutting blade and die assure fast cutting action. The hammer principle eliminates any special skill requirements.

CLEAN Wire rope ends are cut smooth and clean for perfect threading or splicing.

SAFE The enclosed cutting blade locked in the body of the cutter assures perfect safety.

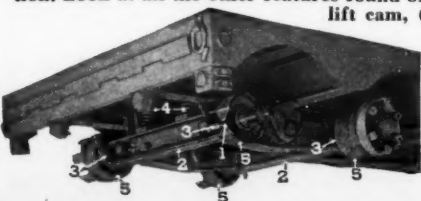
PORTABLE Models for tool kit or stationary operation. With cutting capacities up to: 1 inch, 1 1/16 inch, 1 1/2 inch.

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BE SURE YOUR NEXT TRAILER HAS ALL THESE FEATURES

- Deep, wide flange main beams running the full length of the trailer, I-Beam sections for cross-members and outriggers, improved, fabricated gooseneck, and all electric-welded construction. Look at all the other features found only on Jahn tandem axles: (1) constant lift cam, (2) two full-width axles attached to longitudinal rocker beams, (3) worm gear type slack adjusters at each wheel, (4) heavy coil springs at each axle and (5) positive equalizing braking at each wheel regardless of position of axle.



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Heavy duty trailers from 5 to 100 tons.



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is located between pages 76 and 77 to request literature available to our readers without charge or obligation.

Readers Service Dept.

Contractors and Engineers Monthly
470 4th Ave., New York 16, N. Y.

horizontal storage tanks either by a Cleaver-Brooks Model 2 bituminous booster, or by a Viking 3-inch asphalt pump. The plant also had an 8,000-gallon storage tank for the RC-2 asphalt used in the tack coat, and a 6,500-gallon tank for fuel oil. A Roper 2-inch pump at 60-pound pressure transmitted oil to the boiler through a 3/8-inch line, and to the driers through a 1-inch line.

From the boiler a 2-inch jacketed line carried steam to the asphalt tanks to heat the bitumen to a temperature between 275 and 300 degrees F. A Viking 3-inch asphalt pump pulled the material from the storage tanks to the 750-gallon tank on the continuous mixer. As the aggregate entered the pugmill, it was sprayed with asphalt which was mixed into the stone and screenings at a production rate of 92 tons per hour when ideal conditions were experienced. Two Buda 351 6-cylinder diesel engines drove the plant. One operated the feeder, cold elevator, two driers, and the hot elevator; the other ran the apron feeder, pugmill, and the asphalt pump on the plant.

The mix was discharged continuously into nine Ford trucks holding from 6 to 7 tons each. These hauled the material an average of 3 miles. Due to the narrow quarters the trucks backed under the discharge belt on the plant. On the way out to the road the weights were recorded on a Fairbanks beam scale. The peak production was 600 tons in one day, but usually from 200 to 400 tons were turned out, depending on the number of hours available for work.

Quantities and Personnel

The final clean-up operations consisted of grading the 6-foot shoulders, which have a slope of 6 3/4 inches, with a Caterpillar No. 12 motor grader. From the shoulders the front slopes drop down a 4 to 1 slope for 8 feet to a 2-foot flat-bottom ditch. The backslopes were left as they had been. The original shoulders were 8 feet but the widening resulted in the reduction of shoulder width. Grass seeding of the shoulders was completed last spring.

The major contract items were:

Binder course	5,629 tons
Top course	3,767 tons
Asphaltic concrete, widening	3,522 tons
Asphaltic concrete, leveling	270 tons
Grassing shoulders	37,461 sq. yds.

A force of 36 men was employed by the contractor when operations were in full swing. This included 17 at the plant while the rest were on the road. It did not include the drivers of the batch trucks who were working for Philip Chestnut of Chamblee, Ga., the sub-contractor on the hauling. Payment for batch hauls was made on the ton-mile.

For W. C. Shepherd Co., Inc., Ralph Pledger was Superintendent, assisted by G. C. McRae. H. C. Bessinger was Plant Superintendent. N. R. Nash was Project Engineer for the Georgia State Highway Department which is headed by Warren R. Neel, Director. Sam P. Allison is Construction Engineer. The job was in Division 1 of which W. H. Jackson is Division Engineer with headquarters at Gainesville, Ga.

Telephone Service From Office to Truck

Direct telephone communication with portable units or crews in the field at remote locations has long been the wish of many contractors. It has now been realized through the use of telephone and frequency modulation. And it has been put to use by George J. Igel & Co., Inc., an excavating and grading company of Columbus, Ohio.

Because this firm has many jobs going at one time over a wide territory, it has to move its equipment often. Company officials state that the radio-telephone has promoted a high degree of operating efficiency.

The radio-telephone is furnished, maintained, and operated by the tele-



In the cab of his Autocar, Donald Hickman of George J. Igel & Co., Columbus, Ohio, receives an assignment over radio-telephone. At right, with a Lorain Backdigger in tow, he sets out for the new excavation site to which he was assigned by his boss via this office-to-truck system of communication.

phone company. When it is installed in a truck, the horn is used as a signal instead of a bell, so that it can be heard over the noise of a construction job and at a distance from the truck cab. The person who is placing a call from an

ordinary telephone gives the operator the mobile service number desired, and it goes through much like a long-distance call. At the other end, when the truck driver calls in, he signals the operator and she dials the number he

wishes. A selector unit permits the ringing signal to be received by only the vehicle desired. The telephone company owns all the equipment, and charges a rental fee plus about 30 cents a call.



64 Jaegers, in the below sizes, were supplied for the original salvage work:



2" and 3" portables



Compact 4" pumps



Big 6" and 8" units

the 65th JAEGER PUMP used on the Normandie

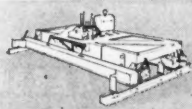


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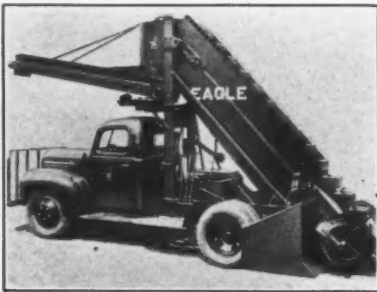
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The Eagle Model 400 truck-mounted loader embodies four improvements: full hydraulic control, lower overhead clearance, conveyor-belt discharge, and positive crowd. It fits most 1½ or 2-ton trucks, and its capacity is 3 to 5 yards a minute.

Improvements Made On Truck-Loader Unit

Four improvements on its Model No. 400 truck-mounted loader have been announced by the Eagle Crusher Co., Inc., 124 No. Washington St., Galion, Ohio. They are: full hydraulic control, lower overhead clearance, conveyor-belt discharge, and positive crowd. This loader model is built to fit most standard 1½ or 2-ton trucks. Its capacity is listed at from 3 to 5 yards per minute.

The hydraulic controls are said to permit control of all operations from a platform located behind the truck cab. The low overhead clearance—11 feet 10 inches—is designed to permit speedier maneuvering on the job and between locations, and to eliminate the need for elevator adjustments. According to the manufacturer, the conveyor belt operates on a 180-degree swing and can discharge wet materials without depending on gravity flow. The positive chain crowd is said to assure movement forward or back at the touch of the controls. Power is supplied through a power take-off. Total weight of the Model 400 is 11,500 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 47.

New Dealer Showrooms

The opening of a new building at Mannheim Road and Madison St., Hillside, Ill., has been announced by the Kennedy-Cochran Co., Chicago construction-equipment distributor. Lines handled by this company include Allis-Chalmers Mfg. Co., Detroit Diesel Engine Division of General Motors Corp.,

Foot Co., Bucyrus-Erie Co., Buckeye Traction Ditcher Division of Gar Wood Industries, Inc., LaCrosse Trailer & Equipment Co., Baker Mfg. Co., and the Gar Wood Industries line for Allis-Chalmers equipment.

New Model Radial Saw

A new model of radial saw has been announced by DeWalt, Inc., 63 Fountain Ave., Lancaster, Pa. The Cut-Master features an easily visible single-degree calibrated scale for miter, rip, and bevel cutting. Mechanical alignments are said to maintain the accuracy of the setting.

A safety feature for ripping operations is a kickback device featuring multiple dogs. And the start-stop switch control is deeply recessed, for safety, in the front end of the machine arm. A crank handle is located in front of the operator for easy elevation of the machine.

The saw is powered by a DeWalt direct-drive motor. Models are avail-



The DeWalt Cut-Master radial saw is safety-conscious. It has a kickback device for ripping, and its start-stop switch is recessed in the front end of the machine arm. Models come in 3, 5, and 7½-hp sizes.

able in 3, 5, and 7½-hp sizes for any voltage, cycle, and phase. The wide worktable is designed to provide ample

working space so that materials for all operations can be handled easily.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 35.

Spex for Line of Rollers

A series of specification sheets describing its line of rollers has been put out by The Huber Mfg. Co., 330 Center St., Marion, Ohio. These rollers range in capacity from a 3 to 4-ton size to the Hevi-Duty 12-ton model.

One sheet covers a variable-weight tandem roller in the 3 to 4-ton class. Another tells the story of the 5 to 8-ton tandem roller equipped with fluid coupling. A third sheet deals with the 8-ton 3-wheel roller. Another tells of the 8 to 10-ton variable-weight tandem roller. And the final sheet in this group covers the 10 and 12-ton Hevi-Duty rollers.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 63.

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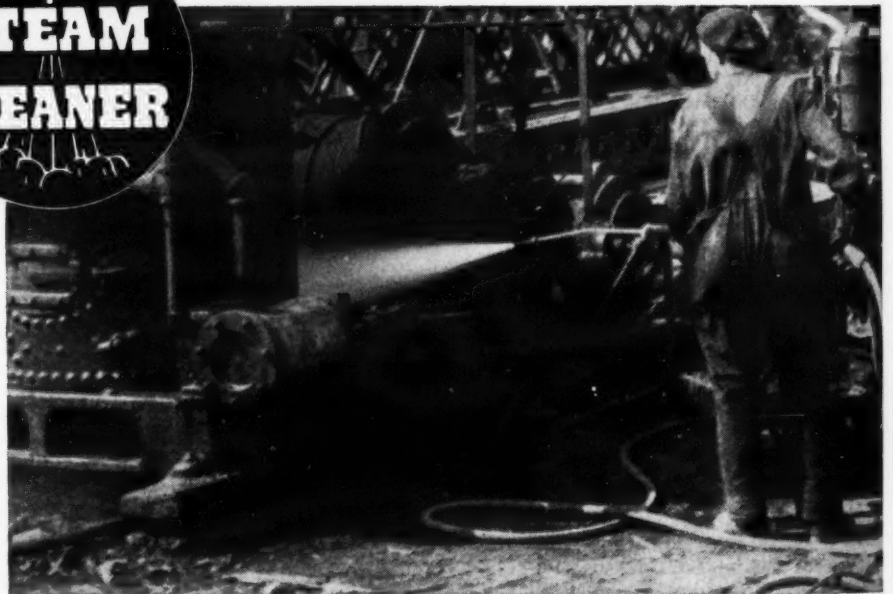
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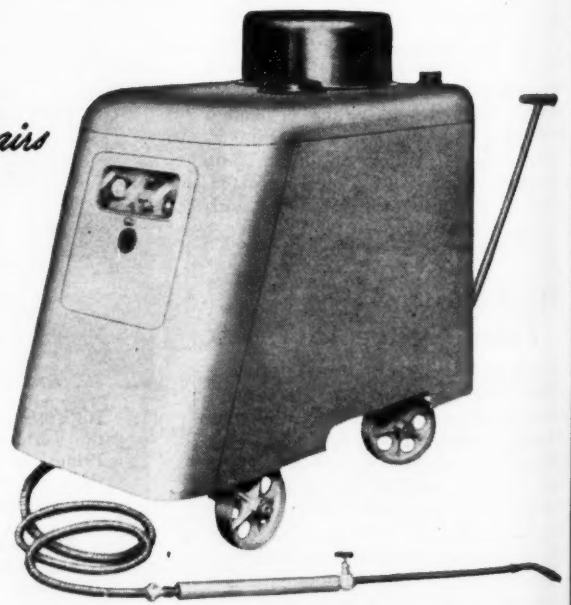
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New Lock-Canal Job Will Help Navigation

Six Contractors Unite in Joint Venture to Build Locks 27 in Mississippi Near St. Louis

THE Chain of Rocks project, to insure safe navigation in the Mississippi River near St. Louis, has been long discussed but is now actually in the construction stage. Six large contracting firms have combined in a joint venture under the name of River Construction Co., to build Locks No. 27 with an adjoining canal. The St. Louis District, Corps of Engineers, is directing the work. On June 19 of this year it awarded the concern a contract for \$16,626,000 to do the job. With a 1,200 working-day time limit, the project is expected to reach completion sometime in 1951.

The six companies holding the contract include the Turner Construction Co., Raymond Concrete Pile Co., Spencer, White & Prentis, Inc., all of New York City; Winston Brothers, Al Johnson Construction Co., both of Minneapolis, Minn.; and Morrison-Knudsen Co., Inc., of Boise, Idaho.

By means of this new canal, 8.4 miles long, navigation will by-pass a dangerous rock formation known as the Chain of Rocks in the bed of the Mississippi at St. Louis. For about 7 miles, from mile 183.3 to 190.5 measured from the mouth of the Ohio River, rock ledges extend out into the river channel from the right or west bank—hence the name, Chain of Rocks. Here the fall of the river averages 1.5 feet per mile as compared with 0.5 foot per mile on the upper Mississippi River, and about 0.6 foot per mile from St. Louis to Cairo, Ill.

When the river is high, the velocity of flow at Chain of Rocks is also high, often in excess of 8 mph. At low-river stages, shallow water interferes with the passage of tows. In 1937 the water dropped to a record low of 5½ feet, causing a serious hazard to navigation. This low-water condition prevents full use of the 9-foot channel depth which is available above and below the Chain of Rocks Reach.

River Navigation Locks

When completed, the new lock-canal project will insure a safe 9-foot navigable channel in the Mississippi from Minneapolis to New Orleans. Above St. Louis in the upper Mississippi this 9-foot channel is maintained by a series of 26 locks and dams. The southernmost of these is Lock and Dam No. 26 at Alton, Ill., just above the confluence of the Missouri and the Mississippi. Incidentally, two of the River Construction Co. contractors—Turner Construction Co., and Spencer, White & Prentis, Inc.—participated in the building of the Alton structure.

Built between 1930 and 1939, these dams are spaced about 30 miles apart with locks to pass navigation. The dams "step" the river in such a way that its velocity is kept below the critical scouring velocity, and only the slow silting of the channels requires dredging. The locks are 110 feet wide, with better than 9 feet of depth over the sills.

The pool formed by the Alton Lock and Dam also extends up the Illinois River for about 80 miles; this, together with 7 locks and dams in the Illinois River, makes available a 9-foot channel from the Great Lakes to the mouth of the river. Below Alton, the 9-foot channel is maintained by regulating works, such as permeable dikes and bank revetment, and by maintenance dredging.

Lock-Canal Project

The lateral canal in the Chain of Rocks project will be in the left bank, or Illinois side, of the Mississippi River. The north end of the 8.4-mile canal will be about a mile south of the mouth of the Missouri River; the south end will be adjacent to the Granite City, Ill., Engineer Depot, and about 3,800 feet upstream from the Merchants Bridge in St. Louis. The center of the project will be back about a mile from the bank of the river which makes a great bend at this location.

In digging the canal, about 28,000,000 yards of dirt will be excavated in cuts varying from 10 to 45 feet. It will have a bottom width of 300 feet, with 1 on 3 side slopes to a top width of about 550 feet.

Since the new lock will eventually accommodate both Mississippi and Missouri River traffic, it is being built larger than any of the existing structures above it. In fact, with respect to length of chamber and height of walls, the main lock at Granite City will be larger than the Gatun and Miraflores Locks of the Panama Canal. The lock is to be located near the lower end of the canal. Two locks actually will be

built. The 1,200-foot-long main lock will be the longest lock on the Mississippi River system, and will permit passage of the longer tows now in service without the necessity of breaking tows. Alongside of it will be a 600-foot auxiliary lock to pass shorter tows and small craft more quickly and economically than could be done in the main lock.

(Concluded on next page)

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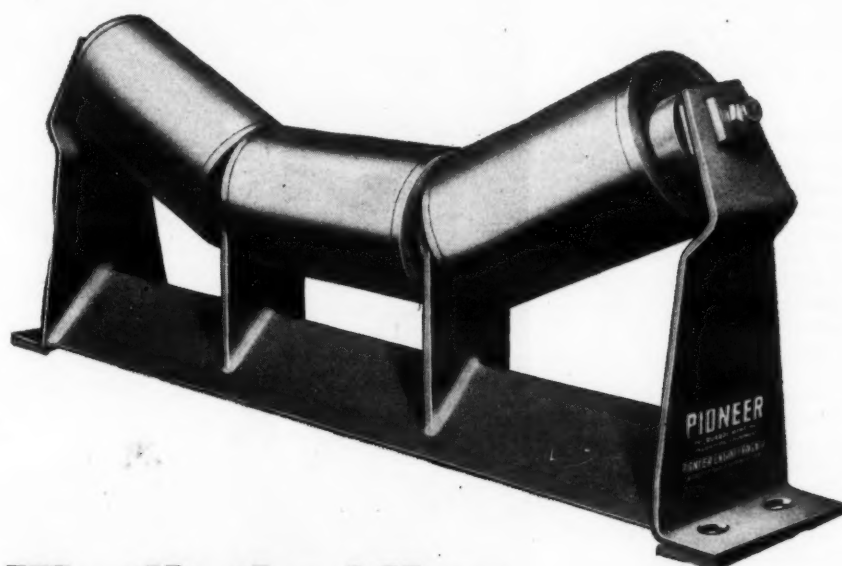


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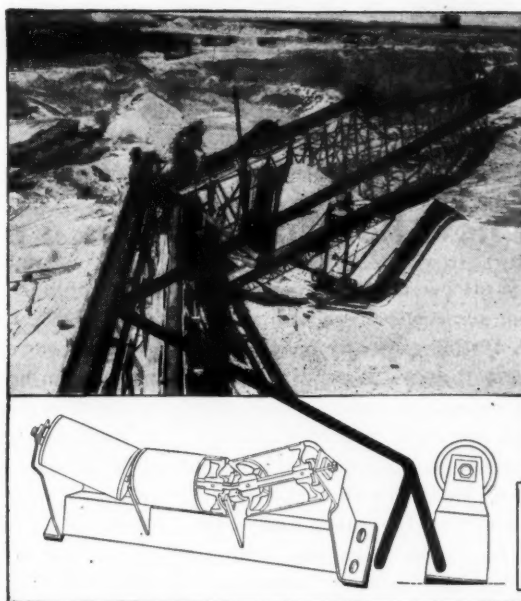
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Continuflow EQUIPMENT

New Lock-Canal Job Will Help Navigation

(Continued from preceding page)

Each lock will be 110 feet wide. The upper lock-gate sills will provide approximately a 14-foot depth at extreme low water of record, and the lower gate sills will be 16.8 feet below low water of record. Lock walls will be 92 feet high, and 4 to 8 feet thick. About 400,000 cubic yards of concrete will be required for the complete structure. The lock will differ from others in the system in that the upstream gates will be of the double-leaf vertical-lift type. Each leaf will be 30 feet high, and each gate, made up of two leaves, will weigh 450 tons.

The downstream gates will be of the miter type. In the main lock each leaf will be 61 feet long, 72 feet high, and will weigh 200 tons. In the auxiliary lock each leaf will be 43 feet high and will weigh 140 tons. The normal lift of the locks will vary from 5 to 11 feet, depending upon the river stage. Their maximum lift at low water will be about 21 feet. About 2,940,000 cubic feet of water will be handled through the main lock for each lockage of 21-foot lifts. At this maximum lift the time required for filling the main lock is 7½ minutes.

Supplementary Construction

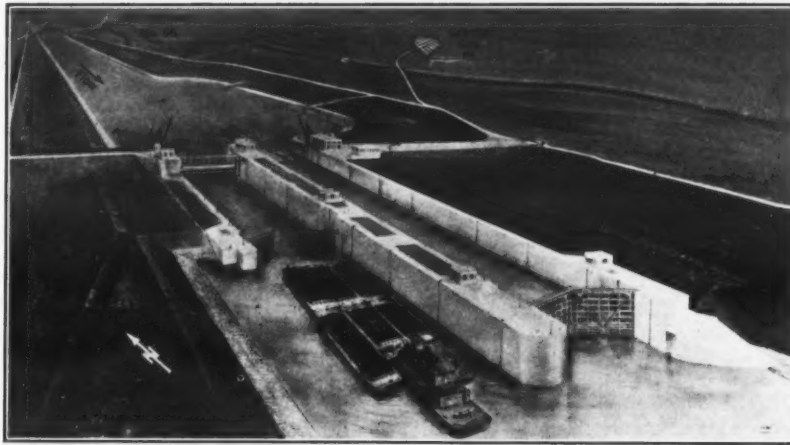
It may be necessary, after the canal and locks are complete, to build a supplemental dam to insure adequate river depth at low water immediately below Alton Dam. It will be a low wicket-type dam, and will be constructed at mile 190.4 in the river, about 500 feet downstream from the Chain of Rocks Bridge across the Mississippi at St. Louis.

Immediately above the locks, the canal will be widened to a bottom width of 700 feet to provide harbor facilities. Levees will be constructed on each side of the canal for protection against floods. The levee on the east side of the canal will become a component part of the East Side riverfront levee.

New Highway Bridge

A new highway bridge is now under construction in the flat river plain through which the canal will be dug. The bridge will carry relocated U.S. 66 over the canal and onto the east approach of the Chain of Rocks Bridge spanning the Mississippi. It is located about 3 miles west of Mitchell, Ill., in the Chouteau Island Drainage and Levee District which was battered in the record June flood this year. The Bushman Construction Co., of St. Joseph, Mo., is building the bridge under a \$1,501,722 contract with the Corps of Engineers.

The bridge will consist of 17 spans and have an overall length of 2,368 feet. Over the canal the steel-truss span will be 465 feet long. It will have a clearance of 50 feet over the maximum stage at which the locks will be oper-



When finished in 1951, Locks No. 27 on the Mississippi will enable navigation to by-pass the dangerous Chain of Rocks near St. Louis. River Construction Co., a joint venture of six firms, is building the locks and 8.4-mile canal for the U.S. Engineers.

ated, with a clearance of 42.5 feet over highwater. The height of the canal-span piers is 99 feet 4 inches, and the depth of the footings for these piers is 7 feet.

Preparatory Work

About 2,500 acres of land and right-of-way, involving 78 separate parcels, have been acquired for the project.

Each tract was appraised separately, and the owners were paid for the land, together with any improvements thereon, on the basis of a fair cash market value. According to the Engineers this "fair cash market value" does not mean the amount the owner may have paid; it represents what the property could be sold for on the open market by one who was willing to sell but not obliged to sell, to one who was willing to purchase but not obliged to purchase.

Several important utilities are being relocated so as to pass underneath the canal across the right-of-way. They include gas, oil, and water lines up to 54-inch diameter.

The project is under the direction of Colonel R. E. Smyser, Jr., District Engineer, St. Louis District, Corps of Engineers. The St. Louis District is one of three districts in the Upper Mississippi Valley Division, Corps of Engineers. The Division Engineer, Col. Clark Kittrell, exercises general supervision over the work. Lt. Col. Paul E. LaDue is Resident Engineer.



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Colored Route Markers Tried in Texas Cities

ReflectORIZED Signs With Different Color for Each Route Are Used to Guide Motorists Through Urban Areas; Results Arouse Interest

By HERBERT ELDRIDGE, Administrative Assistant, Texas Highway Department

THE Texas Highway Department, among others, has diligently worked to improve the marking of highway routes. And through the efforts of the American Association of State Highway Officials, progress is being made towards uniformity in markings throughout the nation.

In a continuous study of the marking problem in Texas, we have sought to improve the marking of routes through cities. In cities many other signs attract the attention of the motorist. Regardless of uniformity in the location and placing of route markers, the motorist must be alert to detect them. In Texas cities generally there are several highways along the same route, with the markers on the same support. This gives a "totem pole" effect. It helps the driver to locate the route marker quickly but adds to his confusion in detecting his particular route.

Studies on this problem brought forth the idea of a route marker on a colored background. We reasoned that if the same colored background were used for marking a route through a city, the driver would have the opportunity to follow his route by the color of the marker as well as by the number. Color-blind drivers would still have the route number to follow. Theoretically the idea was sound, so we proceeded with experiments.

Colors Are Tried

Markers with several combinations of colors showing different route numbers were prepared and erected at several points in the city of Austin. The markers were studied at night to determine legibility and the general effect of the colors. They were made with a background of colored Scotchlite. The numerals and border were stenciled on this background, using a paint of contrasting color.

Scotchlite is composed of small clear glass spheres embedded in a flexible resin plastic sheeting. All spheres are clear and the color is governed by the color of the sheeting upon which the spheres are embedded. The material is applied either to wood or metal by the use of an adhesive liquid.

It was found that the background showed very bright under headlights and could be picked up at distances up to 300 yards; but the numerals which are necessarily small were almost blacked out due to the diffusion of color from the bright background.

The numerals were then made of Scotchlite of a contrasting color to the background. This was done by cutting out the numerals and border and applying them to the blank marker treated with adhesives. The background with cutouts for the numerals and border was then applied. This gave a smooth inlay effect, the legibility was excellent, and there was no further blacking out of the numerals.

Markers of this design were erected through the city of Austin according to the following color combinations:

- U. S. 81—red background with white numerals and border
- U. S. 290—yellow background with marine-blue numerals and border
- State Route 20—blue background with white numerals and border
- State Route 29—green background with white numerals and border

Thus the "totem poles" suddenly took on color, with a very pleasing effect.

Initial reaction seemed to be most favorable. Authority was given to other Districts to carry on similar experiments in other cities. This has been done in the city of Fort Worth.

ReflectORIZED Signs

Experiments have also been made with the reflectorization of signs by the use of paint and glass beads. Good durable beaded markers with good reflection value can be obtained by a paint and bead system which has been developed in the Texas Highway Department. The paint must be one that has a long initial set but will dry hard in 24 hours. A thick film is required to bond the beads strongly so that they will not easily ravel out. The markers

should have a dried prime coat of paint and then a heavy spray film applied at a rate of around 500 square feet per gallon of paint.

Within 15 minutes after the marker has been evenly coated in this manner and before the paint has acquired an initial set, the beads should be sifted on the freshly painted marker. The marker should be placed in a horizontal position on paper or tray which will catch the surplus beads. More than enough beads must be sifted on to saturate the film. Then the marker should be turned to a vertical position and tapped gently to remove the excess beads. This method provides a smooth and even bead distribution so that screening and stenciling of letters can be easily done.

Clear varnish and beads have also been used. The best procedure in this method is to apply the varnish with an air gun after the sign has been completed, and then apply the beads. Signs constructed in this manner have been in place approximately 1½ years and are in fair condition.

Costs of the Signs

The costs of the three types of signs now being made up, and the average cost per square foot of area for the completed signs ready for erection, are as follows:

Painted sign (non-reflectORIZED)	\$0.64
Beads and paint	0.74
Scotchlite	1.10

(Concluded on next page)



LaPlant-Choate scrapers are the only job-proved, completely modern, postwar models with all these profit-making features: 25% easier loading — lower horsepower requirements — faster, cleaner, smoother spreading — positive forced ejection — open bowl — no useless dead weight — low center of gravity — modern, high strength alloy steel — modern, high natural rubber content tires — sturdy construction — low maintenance cost and high trade-in value. As the result, operating records on hundreds of tough earthmoving jobs, working in all kinds of materials, prove that LaPlant-Choate scrapers outperform other leading scrapers by wide margins.

Now, look what this performance means in dollars and cents. Even if you were able to obtain other scrapers at half price, within six months

you would have been way ahead by buying a new LPC scraper. Within a year, you would be better off even if you got the other as a gift. Then, for thousands of hours, your profits will roll in still faster.

Any way you look at it, no matter what kind of scrapers you are using now, you'll be money ahead by replacing them with modern, job-proved LaPlant-Choate units. Another advantage, too, is the fact that LPC scrapers in most sizes (from 2 to 14 yd. struck measure) are ready for *immediate delivery*. Your nearest LPC distributor can tell you how hundreds of contractors are using "higher income" LaPlant-Choate scrapers to bid lower and still make profits. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa; 1022 77th Ave., Oakland, Calif.

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No. of yds. per hr.	74	63*	65*	64**	61***
Estimated earning capacity per hr.	\$18.50	\$15.75*	\$16.25*	\$16.00*	\$15.25*
Estimated earning capacity for 1000 hrs.	\$18,500	\$15,750	\$16,250	\$16,000	\$15,250
3000 hrs.	55,500	47,250	48,750	48,000	45,750
5000 hrs.	92,500	78,750	81,250	80,000	76,250
10000 hrs.	185,000	157,500	162,500	160,000	152,500
15000 hrs.	277,500	236,250	243,750	240,000	228,750

*Manufacturer's own figures. **Estimated. ***Government tests.

LaPLANT CHOATE

Positive **FORCED EJECTION SCRAPERS**

FIRST in Value because they're
FIRST in Performance!

Colored Route Markers Tried in Texas Cities

(Continued from preceding page)

Further Study Needed

The experimental use of colored route markers in Austin and Fort Worth, to determine their relative merits in comparison with standard route markers, has been very limited in scope. It has not been thorough enough to justify a definite conclusion; but on the basis of observations of highway-department personnel and the comments received from motorists, the following trend may be indicated:

1. Colored route markers have a much greater target value than the standard route markers.

2. Due to diffusion of light from the reflective material, the legibility distance of the sign message on the colored route marker shows no appreciable advantage over the standard marker.

3. Highway routes through cities are easier to follow when marked with colored route markers, once the motorist establishes the color combination of the route he wishes to follow.

Inasmuch as these studies have been conducted on a limited basis, further research is needed before colored route markers can be considered for adoption as standard on routes through cities.

From a report presented to the Committee on Maintenance and Equipment at the American Association of State Highway Officials Convention, September, 1947.

Asphalt-Construction Spex

Construction specifications approved by The Asphalt Institute have been compiled in book form. This new edition replaces, with its revisions and additions, the previous edition dated May 1, 1944. It is designed to provide broad, general standards of acceptable methods and materials for assuring satisfactory construction results. The specifications are not intended for specific jobs, but to serve as guides in developing more detailed specifications with narrower limits of tolerance than is desirable in general specifications.

Some of the specifications included cover priming, surface treatment, mixed-in-place asphalt surfaces, penetration macadam, asphalt-macadam base course, cold-laid plant-mix, hot-laid plant-mix surfaces, asphalt-block pavement, and miscellaneous spex on patching, reducing crown, and correcting old profiles, as well as on stockpile maintenance.

Distribution will be made upon request by engineers and officials concerned with such paving problems, when their requests are received on engineering or official letterhead. Requests may be made to this magazine, or by writing directly to the Institute at 801 Second Ave., New York 17, N. Y.

Carbide-Lantern Folder

Its line of carbide lanterns are discussed in a 4-page folder, ADN-4, issued by the National Carbide Corp., 60 E. 42nd St., New York 17, N. Y. This literature gives complete instructions

for filling and charging the generators, suggestions for ordering, and also lists the package sizes in which the carbide is packed.

Specifications are given for the National Carbide line which ranges from small lanterns to the large double-burner floodlight which can yield 16,000

candlelight for 6 hours on one charge. For the small lanterns, a drawing is included with each part numbered to correspond to an accompanying parts list from which to order replacements.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 10.

American Hoist Ups Coulter

The promotion of Lee S. Coulter to the position of Manager of its Industrial Sales Division has been announced by the American Hoist & Derrick Co. Mr. Coulter has been associated with the organization for the past eighteen years.

**THIS ABLE-BODIED WORKER
NEVER MISSES A DAY!**

THE MODEL "M" Dorsey MACHINERY TRAILER

with Built-In **DURABILITY
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Dependable!—the Model "M" is always on the job . . . a gold-star workman putting in a full day's work *every day* for your greater profit!

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Ruggedly built for steady service . . . promising a long, uninterrupted work-life . . . The Dorsey Model "M" Machinery Trailer boasts—

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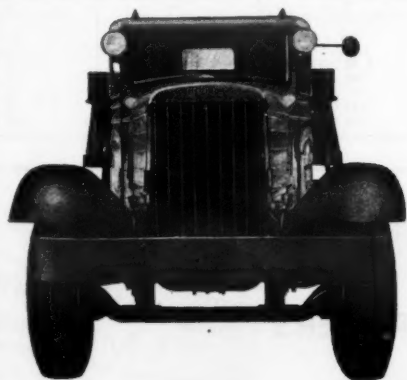
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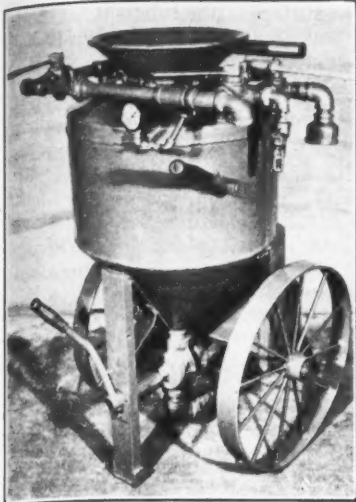
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The Prehy grouter, Type S, has a 3½-cubic-foot tank capacity; its normal working pressures range from 30 to 100 psi. It is applicable for plastic, fluid, and inert grouting, Presscrete construction, and Drypack concrete work.

Machine for Placing Pressurized Concrete

A pneumatic grouting machine for all kinds of concrete construction is made by The Prehy Co., Inc., 420 Lexington Ave., New York 17, N. Y. In addition to pressure grouting and pneumatic concrete work, it is designed for use with two distinctly different types of Presscrete construction: the Premix method, by which a properly mixed hydrated concrete composition is injected; and the Drypack method, by which the cement mortar is injected into a coarse aggregate which has been placed previously and compacted into the forms.

The Prehy Type S grouter is said to be simple in operation. The operator opens and closes the cock-valves for loading, discharge, and agitation of the materials. Tank capacity is 3½ cubic feet. Normal working pressures average from 30 to 100 psi. It uses a 1¼-inch discharge for all usual discharge and intrusion operations, and a 2-inch discharge for Presscrete and coarse-aggregate compositions. Larger or smaller models are available.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 18.

Worker's Safety Belt

Reports at the National Safety Congress indicated that many major accidents on construction jobs have been prevented because workers were wearing safety belts. This is especially important on vertical or near-vertical jobs, such as drilling rock faces, working on upright scaffolds, on bridge and pier caissons, on dam faces, etc.

A belt of this type is made by the Miller Equipment Co., Inc., Franklin, Pa. Made of MillerCord, the No. 12-F belt has a body strap which will adjust from 32 to 42 inches. According to the manufacturer, it is made with tested hardware and reinforced strain points. It is designed so that a bosun board may be inserted if so desired.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 40.

TRANSITS and LEVELS HEADQUARTERS for REPAIRS—any make

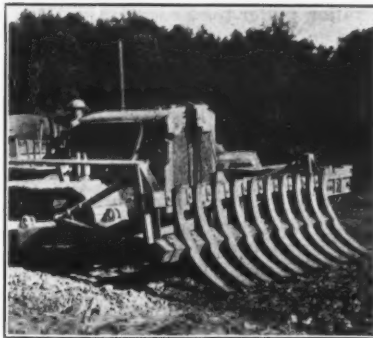
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Tractor Attachments For Clearing Brush

Two auxiliary pieces of equipment for use in land-clearing operations are made by the Florida Land Clearing Equipment Co., Jacksonville, Fla. Sized to match the Caterpillar D6, D7, or D8 tractors, they are designed for use in cutting brush and lateral roots, stumping, and brush piling.

The Fleco Root Rake is said to dispose of top growth and roots in a single operation, and to dispose of cuttings without excessive piling of soil. Uses recommended by the manufacturer include drainage-ditch work, dam construction, road right-of-way clearing, borrow-pit clearing, and piling. The basic frame consists of a heavy steel angle iron across the top of the Root Rake, and a heavy steel boxed section at the center. Brackets are attached to fit the unit to the bulldozer arm or C-frame.

Alloy-steel cast teeth, fully annealed, are bolted to the basic frame in such



The Fleco Root Rake for land clearance, shown attached to a Caterpillar D7 tractor, also comes in sizes to match the D6 and D8. It is said to dispose of top growth and roots in a single operation, and to dispose of cuttings without excessive piling of soil.

a manner that the teeth flanges have 156 square inches of contact per tooth with the center member of the frame. Teeth are interchangeable, and the points can be lowered 16 inches into the ground. The curved design of the

teeth is said to give brush a rolling action which shakes soil loose and permits it to sift through the openings between the teeth.

The Fleco Detachable Stumper is designed for attachment to the frame of angling-blade bulldozers. It is said to provide a cut 24 inches deep and 36 inches wide, for easy cutting of lateral roots with a minimum of soil disturbance. Hard-surfaced teeth are said to be strong enough to lift stump, tree, or boulder as the Stumper pushes it from the ground.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 23.

Quick-Way Adds to Plant

Plans for additional manufacturing facilities to cost approximately \$100,000 have been announced by the Quick-Way Truck Shovel Co., of Denver, Colo. The new building will be erected at the site of the company's present plant.

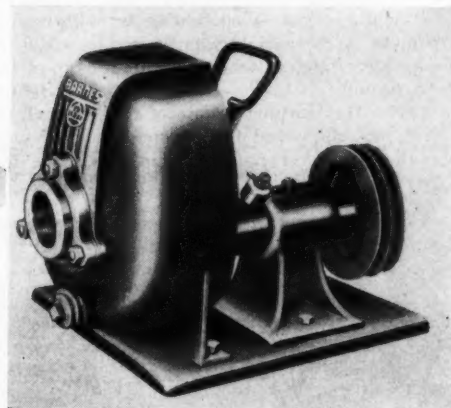
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C. & E. M. Photo
A pair of sheepfoot rollers, pulled by this Case tractor, compacts one of the long runway strips at Austin Straubel Field, with other equipment working in the background.

Earth-Hungry Rigs Grade Big Airport

Heads-Up Contracting Pushes Huge Dirt Job Out Ahead of Schedule In Favorable Weather

WITH diesel engines roaring at full throttle, dirt-moving machines of A. B. Lynch Co. of Milwaukee have virtually finished grading the big 500,000-cubic-yard Austin Straubel Field near Green Bay, Wis. The application of equipment to this tough, wet project was so efficient that earth-moving speeded through ahead of schedule.

If all goes well, the big new Class III airport to serve Green Bay and Brown County, Wis., will soon be a reality. And this despite difficult digging, mud pockets, thin cuts and fills, and a lot of topsoil to dig and handle.

By concentrating Tournapulls and tractor equipment on the grading by day, and using the tractor-drawn scrapers at night on topsoil work, the contractor rehandled very little dirt and solved automatically some of the worst problems of the job. In this way all day shifts were worked to the utmost advantage, while night work, however vital it might be to the job, was limited to "foolproof" digging where nothing could go wrong.

The Green Bay airport is one of the very first jobs approved for construction by the Civil Aeronautics Admin-

istration under the Federal Aid Airport Program. And it is the first of these jobs to be started in the state of Wisconsin.

The work consists, among other things, of grading three strips 4,700 x 500 feet. One runway 4,200 x 150 feet, two runways 3,200 x 150 feet, taxiways, and an apron will be paved with 7 and 8-inch concrete.

The total cost of the project is estimated at \$1,165,000; of this, \$120,000 is provided for the cost of land acquisition. The contract for grading and general construction was awarded to A. B. Lynch Co., Milwaukee, for \$394,385.60. Schuster Construction Co., Denmark, Wis., received the paving contract for \$524,912.00. Anderson Radio & Electric Service, DePere, Wis., will install the lighting for \$49,288.67.

Joint County-CAA Job

A round sum of \$1,000,000 was raised equally by Brown County, Wis., and the Civil Aeronautics Administration to do the initial groundwork. Plans, specifications, supervision and administration of the contract are being handled by Foth, Porath & Horner, Inc., of Green Bay, Consulting Engineers for Brown County. Traveling representatives of the Civil Aeronautics Administration make inspections of the work.

The new field is located about 5 miles southwest of the center of Green Bay, Wis., in a one-square-mile tract of high, rolling farmland. About 85 acres of clearing and grubbing of heavy timber, and another 80 acres of straight clearing were originally included in a \$463,435 contract with Lynch. The situation on funds was so tight, however, that the County took over all clearing and grubbing with its own men, reducing Lynch's contract to \$394,385.60.

The graded section for each runway strip was designed to be 500 feet wide, sloping on a 1.5 per cent grade from the center line of the 150-foot paved strip towards a system of drains and storm sewers. Lynch's contract also included the installation of 33,000 linear feet of 6-inch perforated side drains at the runway edges, and the laying of 18,500 linear feet of storm sewers from 12 to 48 inches in diameter.

A 9-inch blanket course of sand on top of the earth subgrade will be a part of Schuster's contract for paving. The Lynch earth contract will leave the field well graded, with 0.3 foot of rich black topsoil adjacent to the runways.



C. & E. M. Photo
A. F. Keyes (left), contracting partner of A. B. Lynch Co., and Frank A. Love, Resident Engineer for Foth, Porath & Horner, discuss grading problems on the Austin Straubel Field near Green Bay, Wisconsin.

The surface of the subgrade will be left as smooth as a Caterpillar No. 12 motor grader can make it, and sealed by Wobble Wheel pneumatic-tire rolling.

Good Weather Favors Grading

As bad as some of the soft clay pockets were, water-soaked as they were from an extremely wet spring, the job was favored with excellent weather. Lynch Co. had other work under way in a section of the state where sandy soils were found, and was able to finish it in time to move its heavy equipment to the Green Bay airport on July 8, 1947. By July 13, the machines were producing at their peak rate.

Chapel & Amundsen, a subcontracting firm of Green Bay, and Ed Knaus laid the storm sewers ahead of the grading.

Equipment Assigned

With 3,000-foot extreme hauls one way and an average haul of 1,600 feet, Lynch chose a combination tractor-

(Continued on next page)

6 1/2-yard ESCO stripping dragline bucket at Badgett Mine Stripping Co., Earlinton, Kentucky. Width of bucket 78-in.; height 48-in.; length, 87-in.; weight of bucket and rigging 11,970 lbs.; operated by a 5-W Monaghan.



The dragline bucket shown above is one of seven ESCO dragline buckets bought on repeat orders and working on this job. Such repeat orders are evidence of what most contractors know—

ESCO buckets deliver bigger payloads, have the strength to take the punishment of the toughest jobs.

No Excess Weight

ESCO engineers, all practical construction men, place weight where strength is required, eliminate bulk where it is not needed. Often larger size ESCO buckets can be used than would be possible with other makes.

Clean Cutting Front

Streamlined tooth horns are integrally cast into cutting lip—no bulky tooth holders. Flaring end teeth are placed close to edges to give maximum efficiency.

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ESCO Manganese Steel is used for all parts of bucket and rigging subject to wear and shock. This steel polishes in use, lessens friction, gets harder as it works. Parts need not be cast excessively heavy to allow for wear.

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C. & E. M. Photo
This Caterpillar No. 12 motor grader dresses the top of fill at the Green Bay airport to exact grade, as shown by the surveyor's stake at right.

equipment and fast Tournapull fleet to move the dirt. Four LeTourneau Super C Tournapulls with 15-cubic-yard Model LP Carryalls were brought in for the long-haul work.

Five LeTourneau Model W Carryalls and a Wooldridge 18-cubic-yard scraper, each behind a Caterpillar D8, moved the short-haul dirt, and stripped valuable topsoil. Three Caterpillar D8 pusher tractors, one D8 with a push plate and snatch ring, and five Universal 5-kw light plants for night operation completed the picture of that equipment gang.

Auxiliary equipment for processing the earth included two 1,500-gallon water tanks mounted on Chevrolet trucks, with pump pressure to the spray bar. Eight sheepsfoot-roller units and a Bros Wobble Wheel pneumatic-tire roller were also used, with a Case and an Allis-Chalmers tractor furnishing power for the pull. A Caterpillar No. 12 motor grader, a Galion Model 102 machine, and an Adams leaning-wheel grader rounded out the equipment necessary to process the earth after it was dumped.

A truck-mounted lubrication unit was assigned to the project with five grease monkeys staggered on shifts to give round-the-clock service to the big fleet of heavy equipment. This mobile rig contained SAE 20 and SAE 30 diesel-engine lubricating oil in two pressure barrels, and heavy lubricant for transmissions and tractor rollers in two other barrels. Gasoline and lubricating oil for the smaller engines was carried along in 5-gallon containers.

Job Is Staked Out

The feat of moving thousands of cubic yards of dirt well ahead of schedule was accomplished with the aid of plenty of grade stakes. Surveyors were so scarce in Wisconsin this year that A. F. Keyes, Mr. Lynch's contracting partner and manager of the airport project, was unable to find any experienced stake setters. But he did have some likely prospects in the four sons of the partners, John and Bob Lynch and Bill and Bob Keyes. After several weeks of intensive training by Mr. Keyes, this crew was able to go ahead on its own.

The job was originally staked by the Consulting Engineer who had two crews and a supervisor on the job at all times. The contractor checked these, made necessary original stakes, replacements, and set additional stakes as required.

Stakes were set at 100-foot stations at 50-foot intervals, with cut and fill marks roaded in on the side of the lath. Later on we shall see how these stakes were used. But all areas where dirt work was done were filled with survey stakes well in advance of the time the machines moved in.

Mud Slows Job Down

As soon as the machines dug in, it was apparent that they were due for some trouble. Where great stands of trees once stood, the ground was excessively wet. The great rubber-tired Carryalls began to sink down, and

waves of saturated material rolled ahead of the Tournapulls. Pusher tractors were put behind the scrapers, and even when the machines picked up their load the tractors had to stay on to help them out of the borrow pit.

In some places clear water appeared as soon as 18 inches or 2 feet of muck was removed. Places where trees once stood gave the most trouble. Dirt production for the equipment fleet dropped off from a high of 20,000 cubic yards in 20 hours to 7,000 cubic yards when this saturated material was found; then stabilized again at an average rate of 10,000 cubic yards in the two 10-hour shifts. While some of the early performance figures were very high, 10,000 cubic yards was the average figure for the first three-quarters of the project.

Wet as the material was, when properly aerated it made excellent fill. Long sections of the runway strips were filled at one time; and when a 4-inch lift of wet material was spread out over the whole section, the sunny weather did a nice job of aerating away

much of the moisture. The summer of 1947 at Green Bay was hot and dry, as it was over most of the nation, and the Lynch Co., took every advantage of weather.

One serious problem still existed late in the project. It was another wet problem. Those sections in cuts, where wet pockets were found initially, refused to compact to density. As soon as the contractor put a sheepsfoot roller

on top of such a section it began to crack and wave. The clay soil still held about 22 per cent moisture.

A heavy single-moldboard breaking plow was then brought in, put behind a Caterpillar D7, and the top 16 inches was ripped open and laid over on its side to let wind and sun get at the moisture. The clay was in such shape that the slick plow moldboard polished

(Concluded on next page)

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Fan Belt Driven

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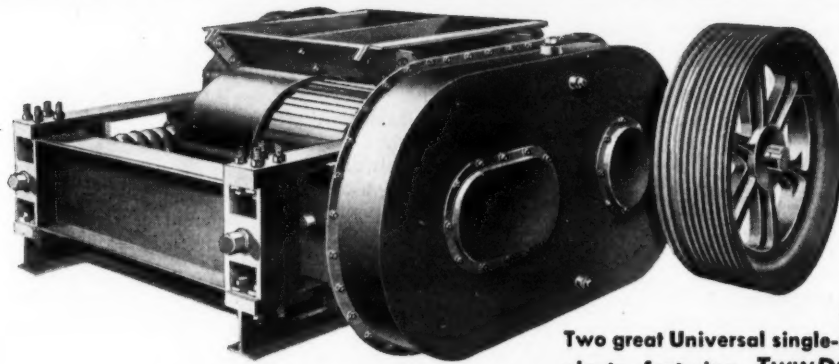
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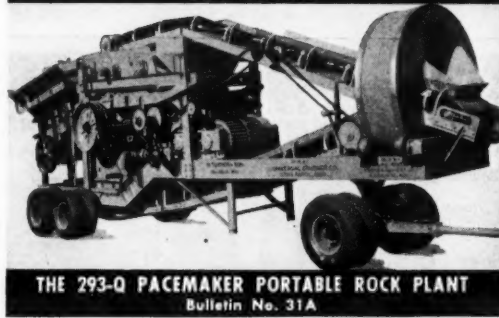
Universal *TwinDual** ROLLS provide the approximate capacity of two separate roll crushers. You get all the advantages of two-stage secondary crushing operations without the bulk and weight. This exclusive Universal unit doubles primary capacity and reduces jaw wear by permitting 100% wider jaw discharge opening. That's why *TwinDual* ROLLS when combined with the world famous Universal overhead eccentric jaw crushers are marking a new era in complete single unit dual portable crushing plants. Smaller primary jaw crushers can be used to gain savings in weight, space and initial cost . . . yet capacity is increased. Two popular Universal portable plants featuring *TwinDual* ROLLS are shown here.

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THE 293-Q PACEMAKER PORTABLE ROCK PLANT
Bulletin No. 31A

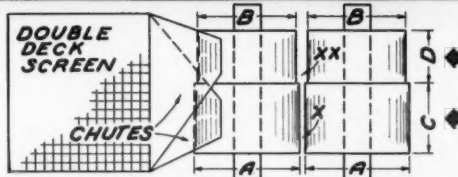


Diagram of feed of *TwinDual* Rolls showing double set of rolls which provide two stages of secondary reduction. In operation, crushed material from the primary breaker together with a percentage of material which does not require primary reduction passes over double deck screen. Oversize retained on the top deck is received by the small diameter rolls for coarse crushing. Following this stage of reduction material passes to bottom deck of screen. Rejects are chuted to the larger diameter rolls for the final stage of reduction.

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ENGINEERS AND BUILDERS OF "STREAM-FLO" ROCK, GRAVEL, AND LIME PLANTS—SCREENING AND WASHING PLANTS—CONVEYORS—APRON FEEDERS



C. & E. M. Photo

Four parts trailers on the Lynch job kept equipment going. The front end of an Adams grader can be seen in the foreground of this picture.

Earth-Hungry Rigs Grade Big Airport

(Continued from preceding page)

the side of each ridge, like heavy cup grease. The situation was whipped, at some cost, by further aeration of the material.

In cut areas the subgrade under paved areas is scarified to a minimum depth of 6 inches and compacted to not less than 95 per cent density. Fill areas, other than those to be paved, are compacted to not less than 90 per cent of maximum density at optimum moisture. And under paved areas, not less than 9 inches below the surface of the subgrade is compacted to 95 per cent of maximum density at optimum moisture, as determined by CAA compaction control tests.

Division of Equipment

A great deal of the job consisted of topsoil work, either stripping it away, stockpiling it, or hauling it directly to its resting place with one handling. All of the graded area except the actual runways gets 0.3 foot of topsoil, and a seeding job next year.

Keyes hit upon the idea, with Phil Kaiser, his General Superintendent, of splitting up the equipment in such a way that as much topsoil as possible could be handled without stockpiling. The Tournapulls and the Carryalls fleet both worked by day on excavation and grading. The Carryalls also made several stockpiles, containing about 30,000 cubic yards of topsoil, which

had to be rehandled in any case.

The topsoil was considered so valuable that it was stripped from most of the graded area. Then at night the Carryall fleet moved in to finish the job. Five big portable light plants were moved in around the cut and fill areas each evening about 5 p.m. after Phil Kaiser had taken the operators out to show them exactly what he wanted. It always helped a great deal to put white flagging on the area which was to be stripped.

"When men know what they're doing, they always work to better purpose," he said. "We figured that if they had plenty of lights to dig by, could always see a grade stake, and had their area flagged off, they couldn't make a mistake it might take half the next day to straighten out."

"And they couldn't make much of a mistake in dumping this topsoil, either. Yellow clay showed up light under the black topsoil, so they could easily see what they were doing."

In fact, one of the catskinners got so good with all this excellent aid that perhaps he figured the tractor itself could do the work. At any rate, his machine tried to climb one of the light plants in full operation one night, and wrecked it pretty badly. He showed up the next shift with an explanation, but unfortunately for him certain administrative arrangements had already been made. So he took his check and went walking down the road.

By working the Carryalls 10 hours at night, the contractor moved about 60 per cent of the topsoil in one handling.

An airport is always a tricky thing to grade, because the hauls must be figured so runways do not have to be crossed after they are paved. Handling of the topsoil got rid of that problem automatically, and also made for a grading job completed as it went along.

The runway and taxiway line stakes were flagged off in red, so even at night the operators always knew where they were. Superintendent Phil Kaiser stayed out on the job each evening late enough to make certain that every man knew exactly what his job was for the shift.

Equipment repairs, when necessary, were made on the job. Parts were stocked in mobile trailers, and a staff of skilled mechanics stayed on hand to give the machines the best of care. Most Lynch equipment is overhauled each winter anyway.

Personnel

In addition to Contracting Partner Keyes and Superintendent Kaiser, whose names were mentioned, Frank A. Love was Resident Engineer on the job for Foth, Porath & Horner. The work was under the general supervision of Lane W. Wilcox, Superintendent of the Airports Branch of the CAA, and District Airport Engineer J. S. Zimmerman of Madison, Wis.

Concise Spex Reduce Cost of Construction

Construction costs can be reduced through closer cooperation of designers and builders. If the specifications are clear and concise, the contractor's element of risk is reduced; he does not need to allow for conditions which may or may not develop.

This is the gist of a paper presented before the Fall Meeting of the American Society of Civil Engineers at Jacksonville, Fla. The paper was co-authored by George B. Hills, Jacksonville consulting engineer, and Charles F. Lovan, President of the Northeast Florida Chapter of the Associated General Contractors of America, Inc.

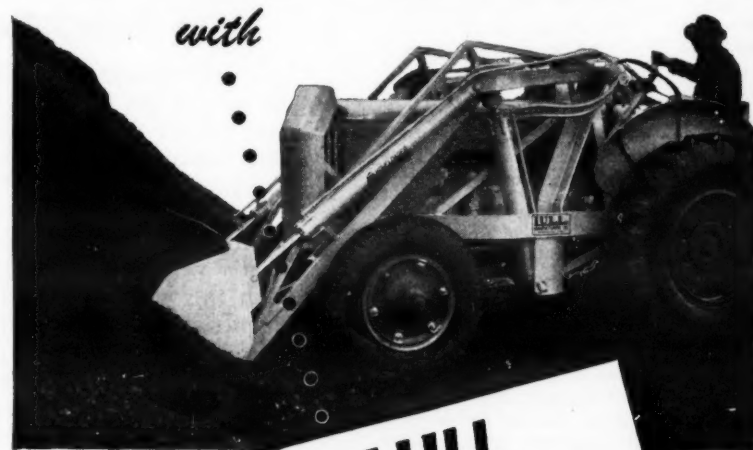
According to the paper, "clauses in specifications make the contractor responsible for oversights on the part of the engineer, for omissions in plans or specifications, and for unforeseen conditions which may develop during the course of the construction." It is the opinion of the authors that costs will be lowered as such conditions and clauses are omitted from project specifications.

Under the present set-up, the only way the contractor can survive is to include in his bid allowances to cover unusual conditions. For when they arise, he must meet them out of his personal resources or out of the proceeds of the estimate. Under the first policy, it is only a matter of time until he will go out of business. Under the second, the owners pay more than the actual and proper costs.

Provision of municipal charters, or of legislative requirements applicable to public work, in some instances determine the policy that the contractor must assume the risk regarding unanticipated costs incurred, the paper pointed out. But "it is not believed that such a policy contributes to the lowering of costs in the construction field."

Ohio has joined the roll of states having constitutional amendments prohibiting diversion of highway-user taxes to non-road purposes. This brings the total of such states to 20.

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Roadside Job Stops Erosion, Cuts Costs

Iowa Roadside Contract Gets Typical Mulching And Seeding Treatment At Mile-Per-Day Speed

♦ **EARLY** in September, M. R. Junkins, roadside contractor of Montrose, Iowa, started a \$50,000 roadside job on a rush order from Western Contracting Corp. of Sioux City. Running low on time and high on contract costs, Western needed a fast job on the roadside work to finish the project in the 1947 season. With several other jobs under way in Iowa, Junkins hurriedly moved men and equipment northeast to the new project.

The Western Contracting Corp. job was located on U. S. 52 and 67, between Dubuque and Bellevue, Iowa, along the high Mississippi River bluffs. Concrete paving, completed early in the summer of 1947, was reported by this magazine. (See C. & E. M., February, 1947, pg. 11.) Roadside work, so far as Junkins was concerned, consisted of 5,800 squares of sodding in ditch bottoms and other spots vulnerable to erosion; 181 acres of seeding on the 15-mile-long highway; and 91 acres of straw mulching.

Junkins' organization, a concentration of well timed mechanical and human effort, has the reputation in Iowa of being one of the fast and workmanlike contracting organizations engaged in roadside work. Close-knit, tightly organized and efficient, the crew is geared to a production of a mile of finished road per day. It has laid as much as 315 squares of sod in a day, and it hoped this year to put up a 400-square day as a record for roadside contractors to shoot at for some time to come.

Over a period of years Junkins has found that roadside work, as much as any big grading job, calls for fine points of organization, a consciousness of costs, and a constantly revised awareness of methods in contemporary use. He should know about that, too, because he ran equipment and grading himself for some time before getting into the roadside game.

Western Does Dirt Work

The preliminary earth work for seeding on this contract consisted of constructing 10-foot-wide earth shoulders, rounding and dressing cuts and back-slopes, filling rocky deposits with earth, and generally smoothing all exposed earth where the new highway had laid bare a raw wound in the otherwise green, hilly country.

Western Contracting Corp., prime contractor on the project for the Iowa State Highway Commission, did all this earth work with its equipment and men. It completed 5 miles before Junkins was called in.

Concrete drain structures and flumes were built by W. A. Radloff, subbing this work, and the Western earth work followed close behind the structure crews. Some of this work was spectacular enough to bring motorists to a stop with a squeal of brakes, especially so far as the motor graders were concerned.

Some of the cuts, as deep as 20 feet, with 2 to 1 back-slopes, were dressed down by Caterpillar No. 12 motor graders, working longitudinally with the slope of the bank. The operators stayed alive by means of a cable—the only thin steel sinew between them and eternity—fastened to both motor-grader frames. One grader stayed on top of the bank to give the necessary stability to the team. The other machine, yawing over far past the safe side for equilibrium, worked a blade of dirt

down the swath of slope, leaving it nice and smooth. At the end of the course the cable was lengthened out another 10 feet, with both machines leveled off safely, and another pass was made. This process was repeated until an entire bank was dressed.

As motorists passed by, however, they couldn't see the cable at once. All they could see was a motor grader practically lying over on its side, crawling along the bank. A day's work at this business was always good for plenty of sight-seers.

Some of the bad places, where spring rains had undermined the banks and soft earth had been pushed in, were especially treacherous. With so much at stake if a mishap occurred, the best grade of cable possible to obtain was



C. & E. M. Photo

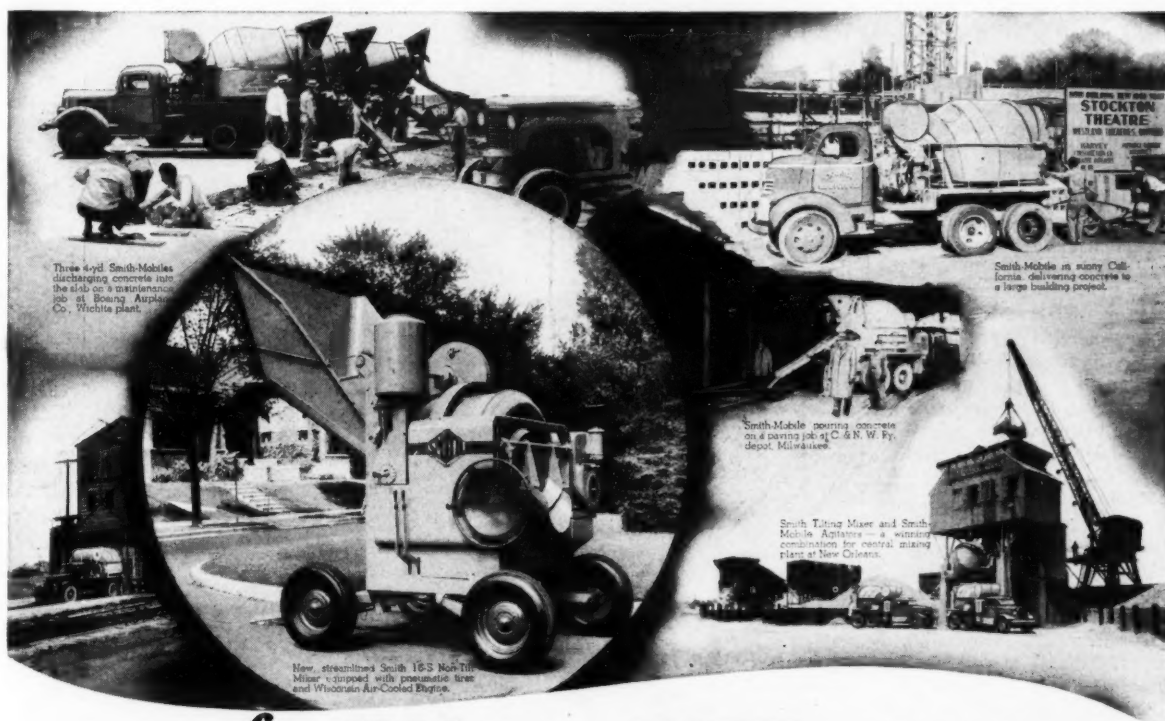
A fast-walking workman is shown here sowing seed with this small hand machine on an Iowa roadside job.

used between the two graders. A long length of 1/2-inch preformed plow-steel wire rope was used, the same type as was used on the scraper and bulldozer controls on the project.

In addition to its strength and the

load-sharing tendency of its wires, preformed wire rope also turned out to be quite easy and safe for the men to handle when they were lengthening the cable to let the grader down the bank

(Continued on next page)



Three 4-yd Smith-Mobiles discharging concrete into the slab on a maintenance job at Young Airplane Co., Wichita plant.

Smith-Mobile in sunny California, delivering concrete to a large building project.

Smith-Mobile pouring concrete on a paving job at C & N. W. Ry. depot, Milwaukee.

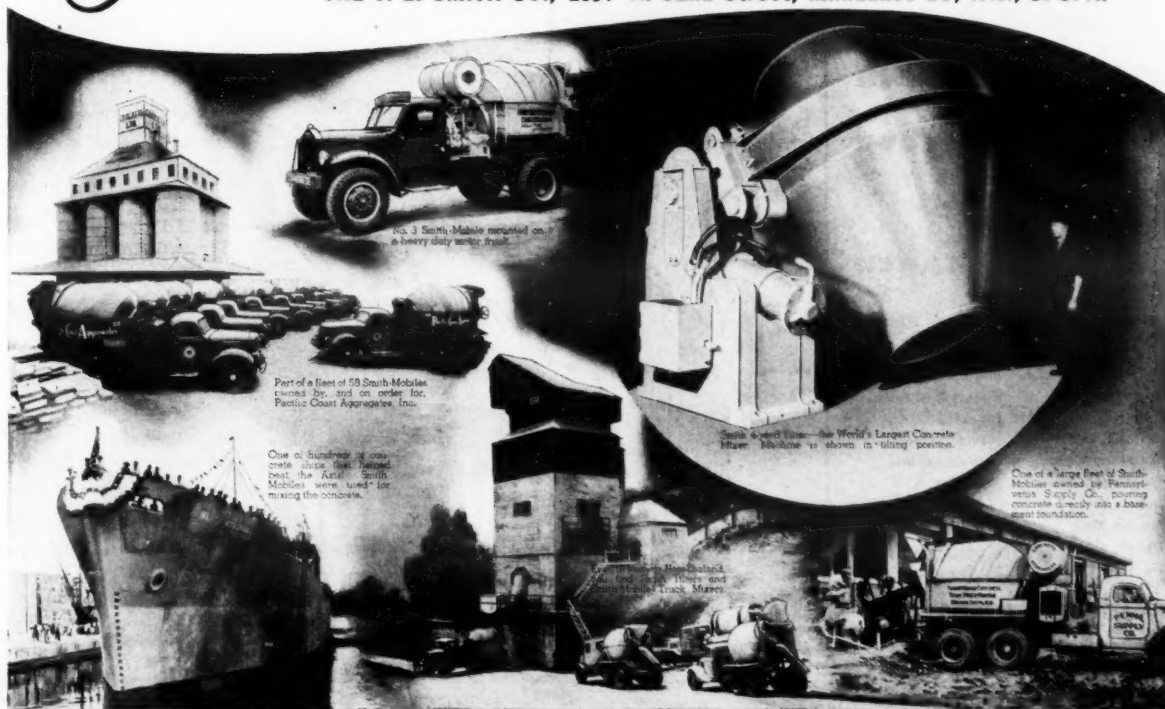
Smith Tilting Mixer and Smith-Mobile Agitator—a winning combination for central mixing plant at New Orleans.

New streamlined Smith 16-S Non-Tilt Mixer—equipped with pneumatic tires and Wharton Air-Cooled Engine.

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In every section of America . . . and in most foreign countries . . . you'll find Smith Mixers and Smith-Mobile Truck Mixers producing big batches of uniform concrete on a fast production basis. Smith continues to be the first choice of experienced contractors and engineers. When faced with the problem of producing mass concrete on scheduled time, they generally specify Smith Mixers or Smith-Mobile Truck Mixers. These dependable machines are being built today better than ever, for big yardage and 'long life. Let Smith Engineers solve your concrete problems. Write today.

THE T. L. SMITH CO., 2857 N. 32nd Street, Milwaukee 10, Wis., U. S. A.



No. 1 Smith-Mobile mounted on a heavy duty motor truck.

Part of a fleet of 50 Smith-Mobiles turned in, and on order for, Pacific Coast Aggregate, Inc.

One of hundreds of concrete slabs laid, paved the Aerial Smith-Mobiles were used for mixing the concrete.

Smith 4-wheel drive—the World's Largest Concrete Mixer. Machine is shown in tilting position.

One of a large fleet of Smith-Mobiles owned by Pennsylvania Supply Co., pouring concrete directly into a basement foundation.



C. & E. M. Photos

Workmen in the left picture lay a straw mulch over a seeded roadside slope. In the photo at right, Iowa Landscape Engineer Dudley Chittenden inspects a long mulched slope west of Ames.

Roadside Job Stops Erosion, Cuts Costs

(Continued from preceding page)

a bit farther. Not one hand puncture from wickered crown wires was suffered by any of the cable handlers throughout the job. According to the men themselves, credit for this was due the inert handling qualities of this better type of cable.

Some of the earth work, impossible for the motor graders to handle, was done by bulldozers and scrapers. Two LaPlant-Choate scrapers, one a 12-cubic-yard machine and the other of 8-yard capacity, were used on this work. The 12-yard outfit with a Caterpillar D8 in front was used for the large-scale transfer of dirt from one place to another, as needed. A Caterpillar D7 alternated between bulldozer work for a while and scraper work with the smaller LaPlant-Choate machine. The bulldozer blade, a LeTourneau cable-controlled type, was laid aside whenever the scraper was picked up.

A Koehring Model 605 shovel and seven 6 x 6 rented dump trucks were used to bail dirt out of borrow pits and build the shoulders. A Caterpillar D6 bulldozer kept the pit clean around the shovel, and leveled some of the dumped dirt close by. A Caterpillar No. 12 motor grader also worked on this operation.

When the shoulders were leveled off to the proper 10-foot width and slope, the grade was checked with a hand level by Archie May, Grade Boss on

the Western paving and Superintendent of the roadside work. Of all the company foremen and superintendents to tackle the Dubuque job, Archie saw it through from beginning to end. After

a wet spring season this year, Archie started about July 1 to get the slopes in shape for Junkins' seeding.

One of the principal problems in this earth work was a predominance of

large rock contained within the slippery clay soil. At one particularly bad spot, the equipment and men spent six hard weeks working out a curve, a rock fill, and some steep slopes. Balancing of dirt and grading on roadside work is not nearly so cut and dried as the same operation is on initial grading. It calls for judgement, planning, initiative, and tolerance.

Working the road in sections ½ mile long in bad places and up to 1½ miles long where grading was easier, his crew finished up the 5 worst miles at the east end of the project before Junkins came in. There was some question, of course, as to whether May's men could hope to stay ahead of the fast-moving seeding gang, whose work naturally could move along faster than the heavier, more cumbersome grading outfit.

Seeding Methods Good

Running true to form, Junkins had finished about 5 miles of planting and

(Continued on next page)



Cab fleet owner likes S.O. Service because it...

Reduces Maintenance 20%

Saves valuable cab time

Protects new equipment

"Our maintenance costs have been reduced 20% since using Standard Oil products—Stanolube HD and Indolube Motor Oils, Standard Greases and Standard Red Crown gasoline," says Anthony J. Ballo, owner of the Red Top Cab Company, Appleton, Wisconsin.

"Not only has maintenance decreased, but time formerly lost because of cabs laid up for repairs has been shortened considerably."

"All of our cabs are late model 1946 and 1947 cars. We want to keep them in first-class condition. This I firmly believe we can do by using Standard Oil products."

Whether you operate a cab, truck, bus, delivery, or construction fleet, a Standard Oil Automotive Engineer can help you make savings like these. If you have particular problems of maintenance or operation, he'll analyze them with your shop men and suggest remedies. He has a heavy-duty fleet motor oil that works magic in cleaning up engines and keeping them clean under the heaviest service. Write Standard Oil Company (Ind.), 910 South Michigan Avenue, Chicago 80, Illinois, for the engineer nearest you.

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mulching in less than a week when **CONTRACTORS AND ENGINEERS MONTHLY's** Western Editor visited the job.

Specifications for the work called for tilling the ground to a high degree of friability for a depth of 3 inches, and planting 15 pounds of broom grass seed and 84 pounds of rye per acre. Later, during the spring season next year when conditions are right, 5 pounds of alfalfa, 3 pounds of red clover, and 2 pounds of alsike seed per acre will be sown.

Junkins kept his work tightened up in order to complete as much as possible as he went along. A section to be worked was first loosened 3 inches deep with a tiller on a Ford farm tractor, if the soil was compacted and hard. Otherwise he used three 8-foot tandem disks, drawn either by one of two Ford tractors, a small Allis-Chalmers, or a Caterpillar 15 machine.

Disk work over the years has resolved itself into the system Junkins uses of tandem disks. By using tandem instead of single disks, he leaves the earth as well graded as it was before the passage of the machine: the second disk returns the disturbed earth windrow to its original spot. Then too there is a naturally greater penetration of the soil with the tandem disks.

On the steep slopes Junkins also found it necessary to work a tractor on top and one at the bottom, with the disks hanging part way down on a cable bridle.

When a section about as long as the day's work had been prepared by disk-ing and harrowing, the cover crop of seed went in. On any places accessible to machines, this seed was planted by two International 10-foot broadcast seeders. Inaccessible places were sown by a Cyclone planter in the hands of Walter Marshall, a walking wizard who can perform miracles with his hand seeder. Some of these seeds are as fine and light as chaff; yet Marshall plants the slopes so well that there are no bare places when the seed comes up. How he does it is a mystery even to Junkins.

When the cover-crop seed was spread, an International and a John Deere tractor and Culti-Packers moved in to work it into the soil. Then the grasses and legumes called for in the specifications were planted, followed by another pass with a Culti-Packer.

If this treatment were all, the first good rain would erode the slopes and wash most of the seed away. To prevent this, the slopes and all seeded areas higher than 5 feet were mulched with rye, timothy, oat, or barley straw. This straw was hauled to the job by two flat-bed Ford trucks, and distributed by a 4-man crew.

One of these men threw the straw to the ground with a pitchfork. Another transferred it halfway up the slope. Two men scattered it around by hand. The straw was spread at the rate of from 3 to 5 tons per acre. When a section of slope was covered at this rate, not more than 60 per cent of the original ground was visible to the eye.

The straw was purchased locally from farmers who live along the new highway. When a roadside-development job first starts, you can buy a haystack for a rather reasonable price. When the farmers realize that such material is absolutely vital, inflation sets in. It doesn't generally take them long to learn that the value of a thing is relative, and that a straw pile is worth more on a roadside than it is on the floor of a stall in the barn.

The first rain after planting sprouts the cover-crop seed, so a good stand of cover material was expected before the winter freeze of 1947.

Sodding Fast but Tough

The faster a crew cuts and lays sod, the tougher it seems to be for Junkins. This is a paradoxical statement, but quite true. For one of the big prob-

lems on a job where hundreds of square yards of sod have to be laid is water. And the more the crews lay, the bigger the problem.

At the time this Dubuque project was visited, sodding of the ditches had not yet begun, but was scheduled to start very soon. Plans had been made to follow the same general scheme Junkins uses for most of his jobs which call for sodding.

Junkins cuts his sod 15 inches wide, by a hand machine, in strips just long enough to lay crosswise across a 4, 6, 8 or 10-foot ditch, whichever is built. Ordinarily the ditches have to carry up to 6 inches of water in heavy rains, and Junkins' crews lay the sod so closely that it serves this purpose excellently.

Each strip of sod, when cut, is rolled up and loaded by hand to a flat-bed truck. All rolls when loaded have their loose end up on top, and are handled that way through all of the steps to prevent the loose ends from unrolling. Some of the jobs have re-

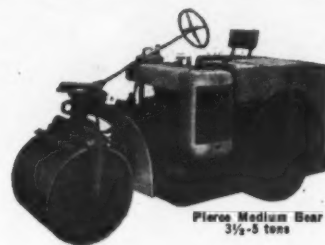
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A Roller For Every Job

Sturdy, heavy-duty rollers, engineered to stand up under the toughest conditions. Pierce-Bear Tandem Rollers are powered by economical Allis-Chalmers 4-cylinder industrial type gasoline engines. Variable weights, from 3½ to 5 tons with built-in water tanks for ballast and wet rolling.



Pierce Baby Bear
2½-3 tons



Pierce Medium Bear
3½-5 tons

The new 2½-3-ton Pierce Baby Bear is designed for close-in work and small area maintenance. It works against a curb up to 25 inches high and within 1½ inches of a higher wall or building. Final drive is within the rear roll. Use Pierce-Bear Tandem Rollers for all-around performance. Write for folder.

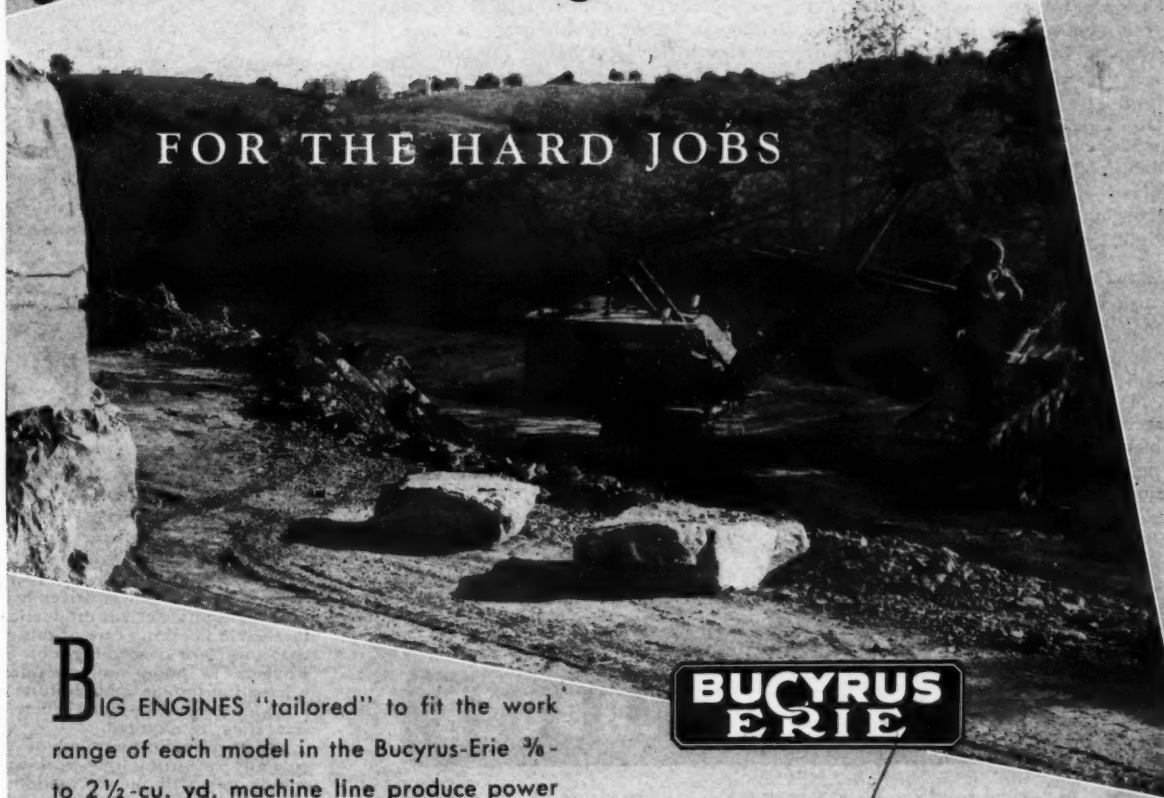
Pierce-Bear Rollers

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Plenty of Punch

FOR THE HARD JOBS



BIG ENGINES "tailored" to fit the work range of each model in the Bucyrus-Erie ¾- to 2½-cu. yd. machine line produce power to meet all demands of excavator and crane service. Simple, efficient, long-lived machinery keeps this power always under the complete control of the operator, who can apply it exactly where he wants it, when he wants it, in the amount he needs.

Transmission is efficiently yet simply lubricated, and wide use of anti-friction bearings for a smooth power flow over a minimum of moving parts further reduces power losses through friction. The smooth-

ness and balance of Bucyrus-Erie power add ease of operation to capacity for long hours of sustained production. Durability of parts and reduction of wear keep maintenance costs low, too.

There are many more reasons why Bucyrus-Eries are "tops" among owners and operators, alike. See your Bucyrus-Erie distributor for more information on how Bucyrus-Eries can help solve your excavating problems efficiently and economically.

BUCYRUS-ERIE CO. SOUTH MILWAUKEE, WISCONSIN



C. & E. M. Photo

Iowa Roadside Inspector Worth Karns (left) and Subcontractor M. R. Junkins of Montrose, Iowa, stand still a moment for the C. & E. M. camera.

Roadside Job Stops Erosion, Cuts Costs

(Continued from preceding page)

quired as much as a gallon of water per square foot when the sod is laid, and decreasing amounts thereafter.

Over the years, Junkins has found out about an interesting characteristic of sod. It does no particular good to cut the sod too thick. Sod cut 1½ inches thick, in accordance with the specifications of the Iowa State Highway Commission, will take root and set in two weeks. If too much topsoil is attached, it will sit there for months like a potted plant, prone to erosion. With too much topsoil on the sod mat, too much labor is required to handle the rolls. The way Junkins does it, a man can handle a 15-inch strip of sod for an 8-foot ditch and do it easily.

With soil analyses run by the state technicians to make the proper check as to plant food, Junkins also finds that the thinner sod will take hold much faster to give the erosion protection required.

Project Was Difficult

Improvisations of equipment use on the slopes, and a host of individual problems that were conquered each day were routine on the Dubuque-Bellevue job. Each load of straw, each load of sod, presented its own special problem of access, and had to be treated as a problem.

The job was one of the most difficult erosion-prevention undertakings at-

tempted in the midwest and the largest one Iowa has ever done, according to Landscape Engineer Dudley Chittenden of the Iowa State Highway Commission. With clay soils, big rock, heavy rainfall, and high run-off velocities to cope with, all the ingenuity that Junkins and Archie May could muster were required. Only by keeping everything caught up as much as possible was the ever-present danger from rain averted.

Even the farmers around that country now point proudly towards the well vegetated slopes and ditches, all accessible to mowers. No more of America's valuable soil will get away from this job, for seeding took care of that. Rainfall need never be a problem. The ingenuity of men and the dependability of modern equipment saw to that.

Because of these factors alone, Iowa's highway engineers can well justify this work. But there is another reason, a mighty important reason. Consider the maintenance costs on the new highway right-of-way.

With little or no further erosion in the ditches and slopes, the normal cost of repairing this damage will be a thing of the past. With slope grades permanently established, the subgrade under the concrete highway will stay much drier than if clogged drains became dams to soak up the embankments. With non-noxious low-growing hay grasses established on the right-of-way, farmers will be happy to mow the material free of charge to the State for the hay they get. Thus maintenance costs will be confined largely to the riding surface of the highway—a necessary evil, true, but better there by far than on the roadside as a perpetual preventable expense.

Thus Iowa moves ahead in roadside engineering. Future specifications for roadside work may soon be divorced entirely from grading contractors, and the State may deal more directly with specialized roadside contractors like Junkins.

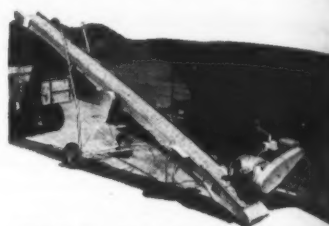
Credit for this design goes to Fred R. White, Chief Engineer; W. E. Jones and A. A. Baustian, Design and Construction Engineers respectively; and to Dudley B. Chittenden, Landscape Engineer for the Commission. It takes planning, study, experimentation, and cooperation to treat a highway as a complete structure to both sides of the right-of-way line.

Hopper-Car Unloader And Stockpiler Team

Two new units which unload stone, sand, gravel, and other aggregates from hopper cars and stockpile them have been announced by the Barber-Greene Co., Aurora, Ill. The 358 unloader is said to have a capacity range of up to 3 tons per minute, depending on the material handled. The other, the 363, is a stockpile loader. Both are mounted on pneumatic tires, and are equipped with handy towing hitches for rapid transport on highways.

The 358 features a chain and belt conveyor. The chain and belt are riveted together by means of steel attachment and cleats. Power is transmitted through chain and belt to give positive belt movement at all times without jam-ups, according to the manufacturer. Drive is by a V-belt, through a speed reducer. There is a roller-chain take-off for final drive to the head shaft.

The 363 is available with plain or cleated belts. It uses a V-belt drive, two



Here's the new Barber-Greene team for unloading aggregates from hopper cars and stockpiling the material—the 358 unloader and the 363 stockpiler.

precision gear reducers, and a shaft drive to the head pulley for transmission of power. The three-unit belt carriers are mounted on welded steel bases through the belt. The tail-pulley cover plate and the hopper plates are removable. Power is obtained from a gasoline engine or electric motor. Available belt lengths are 25, 30, and 35 feet; belt width is 24 inches.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 17.

The most Versatile, Practical SHOP PRESS you've ever seen



BEHIND the label—Rodgers "Sixty" 60 Ton Shop Press with power driven hydraulic pump—is a flexible, highly efficient production unit that will prove invaluable in taking care of those many miscellaneous time and labor consuming jobs. Powered with the Rodgers "D" pump and newly-designed four-way valve, it has all of the desirable features of a streamlined press for general shop use where pressures up to sixty tons are required.

Outstanding features include: An 8" opening between columns permitting long work to be slid through either end of press without obstruction; ram and cylinder may be moved into various positions on the press without changing placement of work; bottom bolster can be raised or lowered easily with a hand crank; and V-blocks for innumerable uses in any position on the bolster. Power pumps are available with or without four-way valve—and in manual or solenoid control.

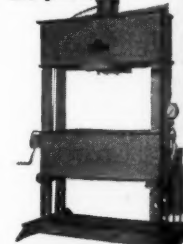
The "Sixty" is but one of the Rodgers series. Standard shop presses are available in 100, 150 and 200 ton sizes, with 300 and 400 tons capacity presses made to order. All include the same proved Rodgers design and performance features. All are rugged, durable, flexible and versatile.

There is a Rodgers Shop Press exactly suited to your needs in any tough service and maintenance work in pressing, squeezing and forcing. Prompt delivery on standard models.

Send today for your copy of the "Rodgers Hydraulic Shop Presses" catalog. It gives complete descriptions, illustrations and specifications of the various models.



Rodgers 150 ton Stationary Shop Press with hydraulic "D" pump and four-way valve arrangement.



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For industrial use . . . for great strength with light weight . . . for ease of handling . . . Duo-Safety's sturdy Type "F" all-aluminum (Duralumin) ladder, with exclusive, indestructible Channel Rail construction, provides the perfect answer. Type "F" is available in all standard ladder lengths.



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DUO-SAFETY LADDER CORP
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At left is a shattered engine casting pulled into alignment by a threaded steel rod along the oil-sump channel. At right is the completed weld which took 30 pounds of Eutectrode 24. Welding time was 48 hours.



Welder's Skill Saves Shattered Crankcase

A Sacramento welding expert recently completed an unusual reconstruction job on a massive Fairbanks-Morse 300-hp marine-engine casting. This casting had been shattered by a broken bolt driven through it by the crankshaft. The casting consisted of a 2-ton crankcase 10 feet in length. Since its normal replacement would have required about 3 months, the emergency weld is said to be directly responsible for great savings in both materials and time, according to the reports received.

The repair involved aligning the ruptured sections by passing a threaded rod along the oil-sump channel and pulling the broken edges together—a feat in itself, since the heavy casting walls averaged an inch in thickness. A preheating arrangement was rigged up which consisted of a large floodlight left in the casting overnight.

The entire welding operation required 48 hours. A special 1/8-inch alloy rod for cast iron, known as Eutectrode 24 ac-dc, was used to avoid a high pre-heat and to produce a strong joint. These rods are made by the Eutectic Welding Alloys Corp. of New York City. A great number of passes were made, consuming a total of 30 pounds of rod. Welds were made both inside and outside, to restore the oil channel.

The original ruptures did not extend to the end of the casting, and 1/4-inch holes were drilled at the end of each crack to prevent it from progressing. The smooth finish of the welds is said to result from using the lowest possible amperage to minimize fusion and prevent the base metal from melting. The rod used is designed to develop a tensile strength of 50,000 psi, and the weld is readily machinable. Peening was used, together with a slight postheat, to stress-relieve the finished sections.

Cooling-System Cleaner

Literature describing its cooling-system De-Scaler has been prepared by the Butler Engineering Co., 2612 Rousseau, New Orleans 11, La. This literature describes the De-Scaler unit, explains what it is designed to do, and how it does it. The method of installation in the cooling system is shown by means of diagrams and text. The bulletin also tells the cause of cooling-system troubles, and quotes the guaran-

tee given with each De-Scaler unit.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 87.

Unit Dumps Concrete Directly to Project

A specially designed dump body for hauling and placing air-entrained concrete has been announced by the Hercules Steel Products Corp., Galion, Ohio. It can also be used to transport aggregates and other bulk materials. Full-scale production of the 3-cubic-yard-capacity model is now under way.

The design of the unit provides for a smooth, complete discharge of the concrete from the bottom of the body first; this is said to prevent premature decantation of lighter materials from the top of the load and to eliminate segregation and bleeding. Four-point suspension and low hinging are employed in the construction of this unit in order to provide maximum safety in high-discharge operations.

Because all excess weight and unnecessary mechanism has been eliminated, this unit, according to the manufacturer, can be used on subgrades in direct pours without any wheeling or



The new Hercules concrete dump body can also be used to haul aggregates and similar materials.

buggies. The Hercules concrete body is also said to be readily maneuverable.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 46.

"QUICK-WAY" TRUCK SHOVELS



Far and away...
THE BEST BUY
Today!

Big Shovel Quality Small Shovel Price

● **SEVEN USES** on one chassis: convertible in minutes from shovel to clamshell, dragline, trench-hoe, scoop, crane or pile driver.

● **TO THE JOB QUICKER:** Truck speed on or off the road... no trailer to wait for or pay for... more hours on the job.

● **FAST HOIST** and swing action that gets more work done per man hour.

● **LOW MAINTENANCE:** Many parts interchangeable, easy to adjust, easy to repair, easy to convert.

● **LOW FIRST COST:** In spite of rising material and labor costs "QUICK-WAY" prices are only 10% above 1941.

Regardless of what larger equipment you have, you need "QUICK-WAYS" too. There's a "QUICK-WAY" owner near you: ask HIM.

Model E: 4/10 cu. yd. cap. for mounting on any standard 5-ton truck.

Model J: 1/4 cu. yd. cap. for mounting on any standard 1 1/2-ton truck.

Service available from Distributors strategically located in U.S. and worldwide



For speed, portability, economy of operation, and adaptability to a wider range of jobs, nothing of comparable size equals a "Quick-Way" Truck Shovel.

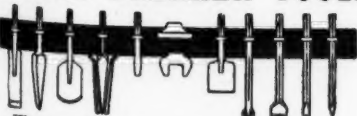
"QUICK-WAY" TRUCK SHOVEL CO.

DENVER, COLORADO

First to build power shovels for truck mounting; still the leader after 28 years

"BICKNELL BETTER BUILT"

PAVING BREAKER TOOLS



We manufacture a complete line of tools for pneumatic paving breakers, rock drills and diggers.

Write for descriptive circular

BICKNELL MANUFACTURING CO.

12 LIME STREET ROCKLAND, MAINE

Construction Safety

Part of Job Planning

National Safety Council Sessions Stress High Cost of Accidents to Both Employer and Employee; Can Be Avoided by Planning and Training

★ **PLANNING** for job safety to lower the now staggeringly high financial and human cost of accidents was the theme of Construction Section meetings at the 1947 National Safety Congress held in Chicago in October. The psychological human factors in accidents were discussed; proper training of supervisory personnel, to insure safe practices on the job, was stressed; and the importance of recognizing safety as an element in job planning was emphasized by all the speakers.

Lloyd A. Blanchard, Chief, Safety Division, U. S. Army Corps of Engineers, and General Chairman of the Construction Section, presided over the sessions, which were attended by 225 contractors, superintendents, safety engineers, and others concerned with safety in construction.

Accident Costs

"The chapter of accidents is the longest chapter in the book", wrote the Englishman John Wilkes some 200 years ago. Nicholas O'Connell, General Superintendent, Turner Construction Co., Boston, speaking at the first session, reminded his audience that the chapter of accidents is still the longest in the book—long and expensive. In a realistic and dramatic presentation of the cost of construction accidents, Mr. O'Connell told the stories of three construction workers and the impact of accidents to them upon their lives and their families'.

The economic and human loss from crippling accidents goes on, Mr. O'Connell pointed out, long after the immediate measurable cost of the accident has been forgotten. "These economic phases cannot be neglected or minimized", he said. "We have a long way to go in accident prevention. We must face the problem squarely. We must face accident costs as we face other costs, and plan for safety with regard to hazards to the men."

Accident costs in relation to prevention costs was the subject of a symposium on the second-session program. Presented in the skit form which has become a feature of Construction Section meetings, this discussion analyzed the accident costs on one construction job and demonstrated the wisdom of providing for accident prevention in any job budget. Participants included Walter J. Byrne, Consulting Safety Engineer of New York City; Dwight W. Winkelman, President of D. W. Winkelman Co., Inc., Syracuse, N. Y.; Robert Hart, Superintendent, Siesel Construction Co., Milwaukee; and Helen Reischel, Industrial Nurse, Employers Mutual Liability Insurance Co. They played the roles of Safety Engineer, General Contractor, Contractor's Engineer-Estimator, and Company Nurse, respectively.

The action of the skit represented a meeting called to discuss accident costs which appeared to be too high. The solution to the cost problem, as it was worked out in the skit, called for greater efficiency in handling first-aid cases (for example, moving the first-aid station to a point where the greatest number of workers was concentrated, to cut down on lost time); the provision of more safety equipment; an assistant to the safety engineer; and more time devoted to planning for safety. The Safety Engineer suggested and the Contractor agreed that 1½ per cent of payroll dollars should be budgeted for job safety. Mr. Winkelman summed up by

stating that, after all, safety is no more than doing the job right.

Planning Job Safety

Another skit demonstrated how planning job safety can eliminate hazards and thereby prevent accidents. Many construction superintendents carry all their plans in their heads, believing action is better than planning, said Otto S. Holmskog, Senior Construction Engineer, Employers Mutual Liability Insurance Co. The skit showed how studying simple diagrams of job layouts at the proper time can reveal potential hazards; these can easily be eliminated if recognized before the work gets under way.

F. A. Khone, General Superintendent, Selzer-Ornst Co., Milwaukee, played

the role of the Contractor; Al Warren, General Superintendent, Hunzinger Construction Co., Milwaukee, that of General Superintendent; and Frank J. Crandell, Assistant Vice President, Liberty Mutual Insurance Co., was the Safety Engineer.

Three job set-ups were analyzed. The first was the layout of a small concreting plant. Study of a diagram of the layout showed a number of hazards, as well as inefficiencies, due to the manner in which the trucks would enter and leave the plant, and to the position of the crane serving the batching plant. Suggestions by the Safety Engineer, working in a friendly and cooperative fashion with the Contractor and Superintendent, resulted in a re-routing of the trucks, elimination of the trucks

backing across a road, and a general improvement in the layout. Since these suggestions were offered before the plant was set up, the change could readily be made. Accidents normally occur from the manner in which an operation is performed, not from the operation itself, Mr. Crandell pointed out. Therefore a study of potential hazards or points of accidents can result in the elimination of at least some of them.

The second problem was that of placing concrete in high wall forms. The concrete was to be delivered by truck-mixer and chuted to a concrete bucket which would be swung by a crane boom to the forms. Analysis of the placing of the men handling the bucket showed

(Continued on next page)

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that a different arrangement would not impair the efficiency of the operation but would lessen the danger of accidents to them. In this discussion, the importance of selecting the proper time for such safety analysis was stressed.

In the third case, the value of planning an entire operation as a whole—and not piecemeal—as well as the value of simple diagrams was demonstrated. In this case, stripping high wall forms and moving the panel ahead was the problem. By following through the complete operation on the diagram, certain hazards were discovered and eliminated by a revision in procedure. An advance study of the methods to be used in any such operation can increase efficiency as well as safety.

Commodore Robert C. Johnson, Ex-

ecutive Vice President, Siesel Construction Co., Milwaukee, told in his address what care, forethought, and planning can do for safety. Commodore Johnson was Commanding Officer in charge of the Seabees on Iwo Jima. He reported on their safety record in the accomplishment of an enormous amount and variety of construction in a short space of time under difficult conditions—lost time for accidents was only 0.2 per cent per 1,000 man-hours worked.

The Navy's point of view on construction safety was a very practical one, Commodore Johnson said. There was an important job to be done; a large investment had been made in training and equipping each man; and replacements were difficult if not impossible to secure. Therefore, if a man got hurt,

the job was short one man. Drawing an analogy to present-day industry conditions and the labor situation, Commodore Johnson suggested that contractors take a similar practical view of safety on the job.

Training for Safety

Since 88 per cent of all accidents are due to personal failure, and only 12 per cent to mechanical failure, the human factor is extremely important in accident prevention, and is too often overlooked. In order to teach safety, one must understand human beings, their biological, sociological, and psychological make-up. Art Matthias, Safety Coordinator, Wisconsin Vocational School System, presented an interesting discussion of this essential phase of the



Courtesy National Safety Council

safety program.

All human beings are potential injuries, he said, because of their biological make-up. Tired muscles, strained eyes, nervousness, hunger—all these cause us to do things which are hazardous. Our emotions and our sociological conditions can also lead to accidents. Mr. Matthias believes that we can't change human personality and characteristics, but we can learn how to deal with them and control them. Habits can be developed; so let's develop safe ones. Distinctive tendencies which are highly developed in one sphere (a sense of responsibility towards one's family, for example, or good will towards one's neighbors) can be developed in other spheres of life, such as a responsibility for safety at one's work and consideration for one's fellow-workers.

To teach others, Mr. Matthias said, one must know people and the rules of teaching. In order to teach safety, one must first secure attention and interest, create the desire to learn and work safely, and make it easy. Commend effort, and insist on repetition which helps form a habit. Supervision of the operation is essential, as is a follow-up to be sure the safe practices taught are being continued as a regular part of the men's working procedure.

Most of all, he said, the supervisor responsible for a group of men must understand people—their emotions, attitudes, and reactions. He should know his men well enough to be familiar with their tendencies and personalities, and to be able to recognize temporary states of mind or body, such as worry, fatigue, etc., which contribute to accidents.

That training for safety pays dividends was substantiated by Robert Hyde, Safety Director for Peter Kiewit Sons, Co. of Omaha, Nebr. Mr. Hyde outlined his organization's program for training supervisory personnel. Since accident prevention is important to job efficiency, it is incorporated in the company's training program. Job safety is more than bulletin boards and posters, Mr. Hyde said. Just as the training program was set up to give supervisors a greater knowledge of how to handle men and equipment, so training in safety emphasizes that continued effort is necessary to prevent accidents. This contractor's safety program follows up its safety training by hitting every job with specific plans for accident prevention on that project. Now two years old, this program has saved time and money and improved efficiency and production, Mr. Hyde reported.

A Public Safety Job

"Controlling the Missouri River—a Real Safety Job" was the title of an address by Brigadier General Lewis A. Pick, Division Engineer, Missouri River Division, U. S. Army Corps of Engineers. Outlining this greatest of all river-development programs, General Pick emphasized its importance to public safety by providing flood control, soil conservation, erosion control, and irrigation, as well as power, wild-life preservation, and recreational facilities.

From the public-safety feature of the project itself, General Pick went on to the safety features in the design of the 105 dams, levees, and other structures in the giant project. He pointed out how inconsistent it would be, after such

(Concluded on next page)

EARTH MOVER



Industrial Power



Construction Safety Part of Job Planning

(Continued from preceding page)

an expenditure of time and money to provide these safety features, to neglect the safety of the men building the structures.

However, since no two jobs are ever alike, each job must be analyzed separately, and safety planned for each. The safety plans for the last job won't fit the present one, he stated, but safety must be considered for each particular job. In the Army Engineers accident-prevention program, safety is made a part of the responsibility of all personnel. Every man is a safety man on an Engineer job, General Pick said.

Drive for New Members

The Fall Round-Up for new members was outlined by Harold Sneed, Chief Engineer, DeWalt, Inc., and Chairman of the Membership Committee. Launching an every-member-get-a-member campaign, Mr. Sneed reminded those present that the Construction Section of the National Safety Council is organized to serve the industry, but that the service it can render is in proportion to the number of members actively interested in it. However, membership dues are not just a contribution to a worthy cause; they pay for materials used in a member's own job-safety campaign, to reduce his own accident costs.

Mr. Sneed told members that special pamphlets have been prepared, giving the details of the membership campaign, to help in securing new members. These may be secured from National Safety Council headquarters, 20 No. Wacker Drive, Chicago 6, Ill., and every member was urged to bring in a new member.

"You know the advantages of membership," Mr. Sneed said, "so tell others about it and get them behind this program of safety in construction."

1948 Officers

Frank J. Crandell, Assistant Vice President of Liberty Mutual Insurance Co., Boston, Mass., was elected General Chairman of the Construction Section for the coming year. Otto S. Holmskog, Senior Construction Engineer of Employers Mutual Liability Insurance Co., is Vice General Chairman. And Harry J. Kirk, Safety Director of the Associated General Contractors of America, is Secretary.

Vice Chairman for Publicity, and Newsletter Editor, is Joseph A. DeLuca, Safety Superintendent of the Construction Division of E. I. du Pont de Nemours & Co. Vice Chairman for Program is Floyd E. Frazier, Manager, Special Services Dept., National Surety Corp. Vice Chairman for Engineering is Samuel R. Bishop, Architect, Representative of American Institute of Architects. Vice Chairman for Membership is Harold E. Sneed of DeWalt, Inc.

Additional members of the Construction Section Executive Committee for 1947-48 are: R. A. Beckwith, Vice President and Chief Engineer, Koehring Co.; C. H. Black, Insurance Manager, Stone & Webster Engineering Corp.; E. A. Blanpied, Safety Engineer, Kansas City Bridge Co.; Walter J. Byrne, Consulting Engineer of New York City; C. M. Cahill, Safety Engineer, Massman Construction Co.; Lee Deardorf, W. L. Johnson & Sons Co.; J. H. Downie, Talbot & Meier, Inc.; Virgil E. Gunlock, Commissioner of Subways and Superhighways, City of Chicago; Ray Hahn, Safety Director, Allegheny Asphalt & Paving Co.; K. W. Hay, Safety Director, Morrison-Knudsen Co., Inc.; Richard Koss, Vice President, Koss Construction Co.; Harold M. McKeever, Editor,

Roads and Streets; Olive E. Potter, Managing Editor, CONTRACTORS AND ENGINEERS MONTHLY; H. A. Radzikowski, Public Roads Administration; H. W. Richardson, Executive Editor, Construction Methods; Vincent B. Smith, Western Editor, Engineering News Record; John P. Sout, Safety Engineer, Fruin-Colnon Contracting Co.; William E. Woodruff, Associate Editor, The Constructor; N. B. O'Connell, General Superintendent, Turner Construction Co.; and R. J. Hendershott, Manager, Associated General Contractors of Minnesota.

The Advisory Committee, which is composed of past Chairmen of the Executive Committee, consists of the following: Lloyd A. Blanchard; Edgar N. Goldstine, Consulting Safety Engineer of San Francisco; Gerard O. Griffin; and Ray J. Reigeluth, Treasurer, New Haven Trap Rock Co.

Representatives of societies and associations cooperating with the Executive Committee include: for the American Association of State Highway Offi-

cials—O. F. Goetz, State Construction Engineer, Tennessee Department of Highways and Public Works; for the American Society of Civil Engineers—Alfred T. Glassett, Vice President, W. J. Barney Corp.; and for the Power Crane & Shovel Association—E. H. Lichtenberg, Koehring Co.

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Cataphote Appoints Agent

The appointment of D. B. Groce as Representative for several of its products has been announced by the Cataphote Corp. of Toledo. Mr. Groce will handle highway signs and markers, reflector buttons, street signs and posts, danger signals, and railroad-crossing signs. He will cover distributors and counties in Ohio and Michigan.

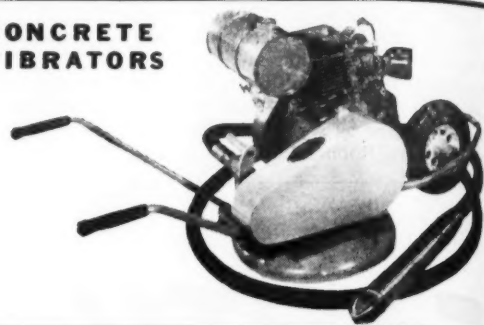
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HD-5 with Baker bulldozer and Carco winch combination.

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Sand-Clay Road Base Is Stabilized With Slag

Double Bituminous Surface Treatment Tops Recent 9.9-Mile Reconstruction Highway Project

THE Mississippi State Highway Department has recently finished the reconstruction of a 9.9-mile section of gravel road into a durable highway with a bituminous wearing surface. The new project in Clarke County connects Enterprise on U. S. 11 with Quitman on U. S. 45, 25 miles south of Meridian in the eastern part of the state. A. A. Bush, a Laurel, Miss., contractor, was awarded the job on a low bid of \$152,550. It was completed between November, 1946, and June, 1947.

The new highway has a sand-clay base from 12 to 18 inches thick and 26 feet wide, the full width of the roadway between slope lines. This base is stabilized with slag, mechanically mixed into the sand-clay material, and then topped with a double bituminous surface treatment 20 feet wide. On each side are 3-foot shoulders.

The old road was of varying narrower width, and was characterized by a rough surface, especially in rainy weather. Its alignment was good, however, and was followed by the new road. Thus traffic had to be maintained during the work. A 2-mile section of bituminous pavement through the cotton town of Stonewall, about midway of the project, was in fair shape and was skipped in this contract.

Grading and Base Course

Since the alignment remained unchanged, excavation was a minor item; only 16,810 cubic yards of dirt had to be moved. This was done chiefly in flattening curves or in removing undesirable material from the subgrade. The roadway excavation was handled by a single Wooldridge 10-yard scraper pulled by an International TD-18 tractor equipped with a Bucyrus-Erie 12-foot dozer blade. Hauls averaged only 300 feet.

With grading out of the way in short order, the big job of bringing in roadbed topping material and spreading it on the subgrade got under way. Suitable material was obtained from three pits requiring an average haul of 3 miles to the job. Two of the pits had roadside locations, while the third was ¾ mile off the road on a good haul lane. A Byers 65 dragline with a 30-foot boom and a Hendrix ¾-yard bucket loaded the material into a fleet averaging ten trucks, Fords and Chevrolets, holding about 4 yards each.

The material was dumped on the subgrade and spread in layers not exceeding 6 inches by the TD-18 tractor-dozers. Since all this work was done during winter months when the soil was customarily wet from the seasonal rains, no water had to be added in order to obtain suitable compaction. Each layer was rolled by a Slusser-McLean sheepfoot roller pulled by an Allis-Chalmers HD-7 tractor.

All of the topping material was required to pass a 1½-inch sieve, while not more than 25 per cent was permitted to be retained on the No. 10 sieve. Sand was the chief component of the soil which contained only small proportions of clay and silt. Other restrictions were that its liquid limit should not be more than 25, or its plasticity index greater than 8. A typical analysis of the material showed the following characteristics:

Sieve Size	Per Cent Retained by Weight
No. 10	20-60
No. 40	30-70
No. 60	60-90
No. 270	3-20
Silt	7-20
Clay	

In conjunction with the grading and



C. & E. M. Photo

A Byers 65 dragline, with a 30-foot boom and a Hendrix ¾-yard bucket, loads a Chevrolet truck with 4 yards of sand clay for topping. The material was taken from a roadside borrow pit.

base-course work the contractor also constructed three new concrete culverts

to provide better drainage for the improved highway. Two of these are 10 x 6 x 35 feet, while the third measures 10 x 5 x 35 feet.

Slag Stabilization

Originally the Highway Department intended to stabilize the sand-clay base course with gravel, and a little of this material was incorporated into the base. Then a shortage of railroad cars for transport of the gravel brought about the substitution of slag for gravel as a stabilizing agent. The Birmingham Slag Co., of Birmingham, Ala., shipped slag to the contractor at fairly regular intervals so that the project could be kept moving. Hopper-bottom cars transported the material via the Southern Railway to Meridian where they were switched to the tracks of the Gulf, Mobile, & Ohio Railroad for the remainder of the distance to Quitman.

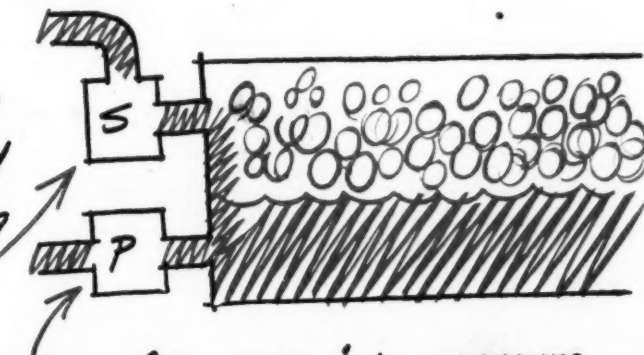
At the Quitman siding the cars were maneuvered over a trough in the tracks by a Case rubber-tired tractor which

(Continued on next page)

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C. & E. M. Photo

A Farquhar conveyor loads a Mississippi Wagon pulled by an International MRS Special tractor with $8\frac{1}{2}$ yards of slag from a hopper-bottom car. The material was used to stabilize sand-clay base course on the Bush contract.

Sand-Clay Road Base Is Stabilized With Slag

(Continued from preceding page)

pulled them into position with a long towing cable. A Farquhar conveyor did the unloading. This unit has an 18-inch belt which is 20 feet long on the inclined plane, and $22\frac{1}{2}$ feet long on the horizontal section fitting in the trough under the discharge hoppers of the cars. Each section of belt was operated by a Wisconsin engine. A 60-ton carload of slag could be unloaded in from 45 minutes to an hour when enough trucks were available to keep the conveyor busy. An average of five trucks hauled the slag, a Dodge, GMC, Chevrolet, and two Fords, carrying about 5 yards each, and hired by the

hour. The contractor also used his own Mississippi Wagon pulled by an International MRS Special rubber-tired tractor in this work. The unit was loaded with $8\frac{1}{2}$ yards of slag.

The trucks end-dumped and the Mississippi Wagon bottom-dumped the slag down the middle of the road while moving along at about 30 mph. By dumping at this rate of speed, they spread the slag thin enough so that motor graders could move it quickly and evenly over the entire roadbed without having to knock down any large piles of material.

From $1\frac{1}{4}$ to $2\frac{1}{4}$ cubic feet of slag was spread over a square yard of base course. This range was necessary because of the varying gradation in the topping material. A stabilized base course, according to the specifications,

must contain 35 per cent of metal (coarse aggregate). So where the topping material was rather fine, more slag was in order. Where the sand-clay was coarse, a lesser amount of slag was needed.

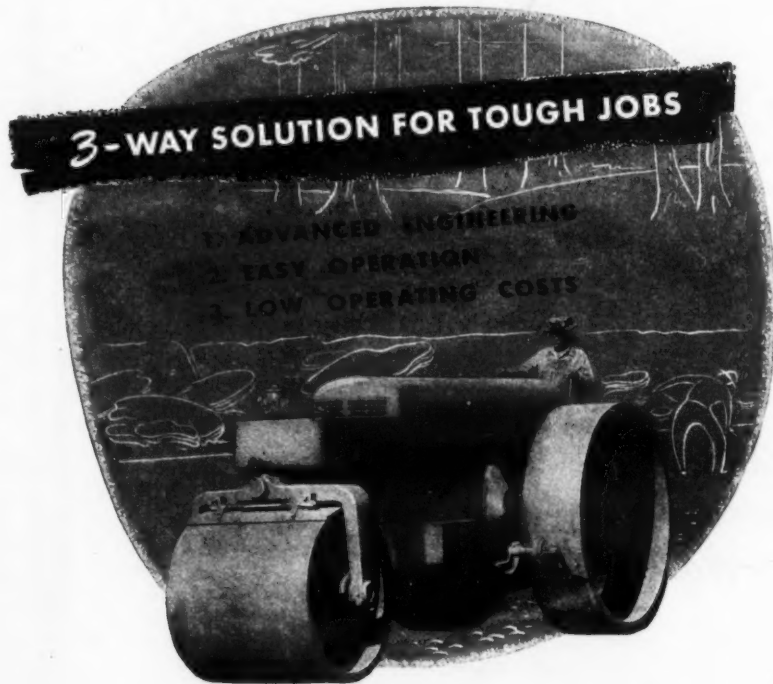
For proper stabilization the slag was required to be incorporated into the upper 5 inches of the base course. Two motor graders, a Warco and a Galion 102, both with 12-foot blades set at 45-degree angles, first spread and leveled the slag over the entire roadbed. Then a Seaman Pulvi-Mixer pulled by an International T-6 tractor mixed the slag into the sand-clay base; it worked in lanes 6 feet wide from each edge towards the center. The two different materials were actually mixed to a depth of 7 inches so that when the loose material was compacted the resulting stabilization would be 5 inches thick. Only one pass was necessary for complete mixing. To control traffic better, the sections that were being worked were usually limited to one mile in length.

When the base was turned over, it was generally rather dried out, so water was added to obtain the 8 to 10 per cent moisture content desired. Then the stabilized material could be compacted to 95 per cent of maximum density. Water was sprayed over the roadbed from bars at the rear of two 1,000-gallon tanks mounted on International trucks. Each carried a Jaeger 3-inch pump to fill the tanks with creek water.

Rolling was done with a Tampo pneumatic-tire roller, four wheels in front and six in the rear, pulled by the Case rubber-tired tractor. On the straight-aways the roller worked from the edges towards the center, while on the curves the rolling was done from the low to the high side. The road has a parabolic crown of $1\frac{1}{2}$ inches in 10 feet.

In order to have a minimum of 30 per cent of the slag passing the No. 10 sieve, two different grades of slag were combined so that more fines were obtained. Their sieve analyses follow:

(Concluded on next page)



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Pictured here is the Rogers Type D, eight rear wheel, two-way oscillating axle trailer. This trailer readily conforms to roadbed irregularities. Eliminates any tendency toward deck weaving or distortion.



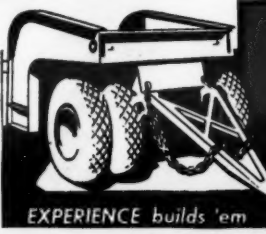
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Shown above and at right are two views of the Rogers Walking Beam Trailer. Side swinging brackets permit operation with 8 or 10 ft. deck widths to conform to certain state requirements.






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Sieve Size	Per Cent Retained by Weight	
3/4-inch	0-5	0-20
1/2-inch	0-10	10-50
No. 4	60-95	40-80
No. 10	80-100	60-95
No. 60	90-100	90-100

When the material was available, the contractor spread and stabilized 400 cubic yards of slag in a 9-hour day.

Bituminous Surface Treatment

Before any bituminous work was done, the base course was opened to traffic for 30 days which also contributed to good compaction. Then the center 22 feet of roadbed was primed with MC-1S cut-back asphalt applied at the rate of 0.35 gallon to the square yard. The prime was put down a foot outside the edge of the future surface treatment to prevent possible raveling. A 1,000-gallon distributor mounted on an International K5 truck and equipped with a Cartwright spray bar applied the prime full width at a temperature of 125 degrees F. The bituminous material was furnished by the Southland Oil Co., Inc., of Sandersville, Miss., 45 miles away. Transport trucks hauled the bitumen to the site where it was transferred to the distributor. The prime penetrated the base course from 1/8 to 1/4 inch, and was permitted to cure from 5 to 7 days before work began on the mat; during these operations the road was closed to traffic.

A 20-foot-wide application of AC-15 asphalt was first put down at the rate of 0.4 gallon to the square yard. This was covered with coarse slag at the rate of 45 pounds to the square yard. Two Buckeye 10-foot-wide spreader boxes, each on four rubber-tired wheels, were hooked to the rear of the trucks which backed down the road side by side covering the bitumen with the slag mat. The aggregate was at once rolled into the bitumen by a tandem 8 to 10-ton smooth-wheel roller, working from the edges towards the center of the road. This was followed by the pneumatic roller and then traffic was let on the road for two weeks so that the slag would get firmly embedded into the asphalt.

The seal coat then followed. It consisted of an application of AC-15 asphalt at the rate of 0.25 gallon to the square yard. After smooth-wheel and a finer grade of slag, 30 pounds to the square yard. After smooth-wheel and pneumatic-tire rolling, the road was opened to traffic.

The coarse and fine grades of slag met gradation requirements in the following table:

Sieve Size	Per Cent Retained by Weight	
1 1/4-inch	....	....
1-inch	0-5	....
3/4-inch	40-80	....
1/2-inch	90-100	0-5
3/8-inch	....	10-40
No. 4	98-100	85-100
No. 16	....	97-100

Final clean-up operations included grading the 3-foot shoulders to a slope of 1 inch per foot. The front slopes to the V-type ditches are 3 to 1, while the back slopes are 1 to 1.

Quantities and Personnel

The major quantities included in the 9.9-mile reconstruction contract are:

Unclassified excavation	16,810 cu. yds.
Roadbed topping material	85,606 cu. yds.
Stabilizing slag	9,575 cu. yds.
Prime coat, asphalt	45,240 gals.
Asphalt for mat	88,232 gals.
Coarse slag for cover	2,179 cu. yds.
Fine slag for seal	1,089 cu. yds.

An average force of 25 men was employed by contractor A. A. Bush under the supervision of Speedy Channel, Superintendent. S. L. Scott, Assistant Project Engineer, represented the Mississippi State Highway Department. The Department is headed by R. A. Harris, Chief Engineer, while S. A. Tomlinson, Jr., is Construction Engineer.

Gorman-Rupp Appoints Vine

H. W. Vine has been named Manager of Industrial Sales for the Gorman-Rupp Co., of Mansfield, Ohio. Mr. Vine has been active in the industrial pump field for over 43 years.



International Harvester's centennial is the occasion for this swarm of young men on a TD-24 crawler tractor, which weighs 46,000 pounds equipped with a bulldozer and is powered by a 170-hp diesel engine. The men are members of a roads and highway class in civil engineering of the Illinois Institute of Technology. The place is "Harvester's 100 Years in Chicago" exhibition adjacent to Soldier Field. A display of industrial tractors and matched equipment features the 10-acre exposition.

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- 2 Here's a complete line of jaw crushers from 12" x 12" to 36" x 48" and cone crushers from 12" x 12" to 18" x 24" for your portable and stationary plants.
- 3 Three sizes of hammermills will meet all your requirements for crushed materials up to 1 1/2" sizes of agricultural limestone.
- 4 Cedarapids horizontal vibrating screens have everything for faster, better, more profitable screening. Sizes from 2' x 6' to 4' x 12' in single or double decks.
- 5 The Patchmaster is a rugged, low-cost, continuous-mix plant for producing bituminous mixes to specifications. Capacity 20 to 30 tons per hour. Master Mixer will handle still greater volume.
- 6 The Model "FA" is our most portable, batch-type bituminous mixing plant, 25 cu. ft. capacity. Gasoline, diesel or electric power.
- 7 For your biggest black top jobs, buy a Model "F" portable, batch-type bituminous mixing plant, 1,000 or 4,000 lb. capacity. Gasoline, diesel or electric power.

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| BUCKET ELEVATORS | PORTABLE POWER CONVEYORS | TRACTOR-CRUSHER PLANTS | REDUCTION CRUSHERS |
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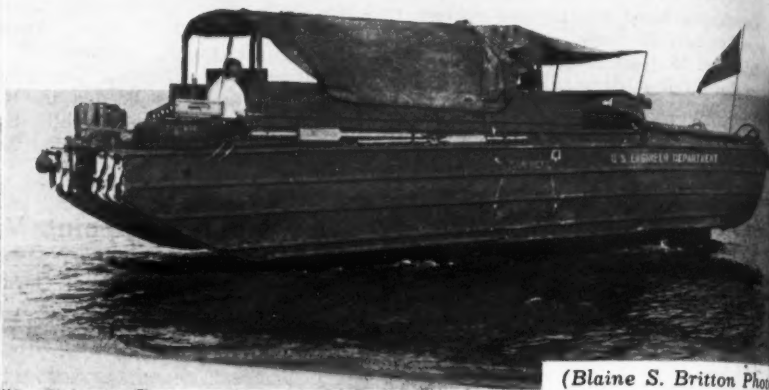
ARIENS AGGMIXER

The swirling, chopping action of these lines does a thorough job of mixing, wet or dry.

HERE'S equipment designed especially for mixed-in-place construction—to operate in connection with other general purpose equipment. Wherever aggregates are used it thoroughly pulverizes, mixes and aerates aggregate with binder—rapidly and economically. Also ideal for soil cement stabilization. Safe and easy to operate... adjustable to any tractor... made 4 standard sizes, 4', 5', 6' and 7'. Write for details.

ARIENS COMPANY **BRILLION WISCONSIN**

Engineers Try New



(Blaine S. Britton Photo)

THE DUCK. Equipped with a Navy echo depth-sounding machine, an Army Duck rolls down the beach and into the water to start out on another range of an underwater survey of Lake Michigan's shoreline. Brackets amidships provide an alternative mounting for the sending and receiving cones of the depth-sounding machine. The Duck is steady in water and easy to harbor—any sloping beach will do.

Use Navy Echo Depth-Sounding Machine And Army Duck to Survey Lake Shoreline



TRANSIT GUIDANCE. The party transitman, T. A. Kragness, guides the Duck on the range, which runs out into the lake past the 30-foot contour. He uses the light on top of his transit to signal the Duck operator when he veers north or south of the range. The diagonal black stripes on the stern of the 8-ton amphibious truck are useful in highway traffic.

IN cooperation with the State of Illinois Department of Public Works, the U. S. Engineers, Chicago District, recently made an underwater survey of Lake Michigan's Illinois shoreline.

In an Army 8-ton amphibious DUKW, commonly called a Duck, they mounted an echo depth-sounding machine which sends out 300 supersonic waves a minute. These waves go to the bottom of the lake and bounce back up to the surface. They literally burn a mark on a rotating-drum chart the instant they are sent out and the instant they are picked up again. The difference between the two points on the chart is in direct ratio to the depth.

The Illinois Department of Public Works set up survey ranges at 1-mile intervals from the Indiana to the Wisconsin state lines. The Engineers then ran these ranges from 2 to 4 miles out into the lake, past the 30-foot contour. On shore they set up a transit sighted out on the range. The transitman used a signal lamp on the transit to keep the Duck on the range.

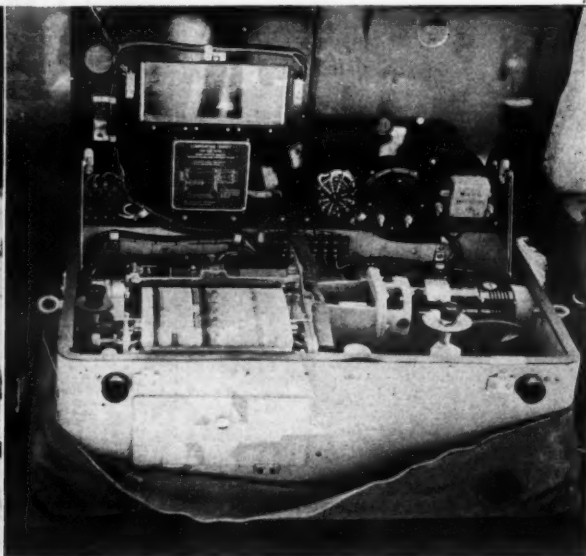
On shore a water-depth gage and reader took the water level at 5-minute intervals, so the chart from the Duck could be related to the low-water datum of the lake. On the Duck, a

sextant reading of two predetermined shore objects was taken every 5 minutes, and this bearing was placed on the chart across the depth at which it was made. Duck crew members also took bottom samples and placed them in numbered jars for future study. They recorded position and sample numbers across the chart.

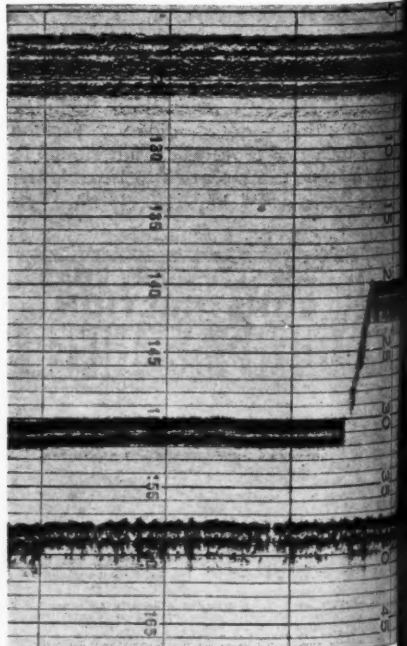
When a radical change in load brought the Duck higher or lower in the water, a test bar was run over the side and suspended at the 10, 20, and 30-foot levels. The resulting test "depths" were checked on the chart and, if necessary, the machine was adjusted to bring the recording back to the proper depth mark on the chart.

The Engineers found the chart more accurate than lead soundings. For where silt occurred, a double bottom line appeared on the chart: the first showed the surface of silt, and the second showed the sand or hard bottom.

Soundings could not be made on more than 2½-foot waves due to vertical movement of the Duck. However, they were made during the summer, and completed well before the close of navigation. They will provide more complete knowledge of wave action, erosion, and shifting of sand in the area.

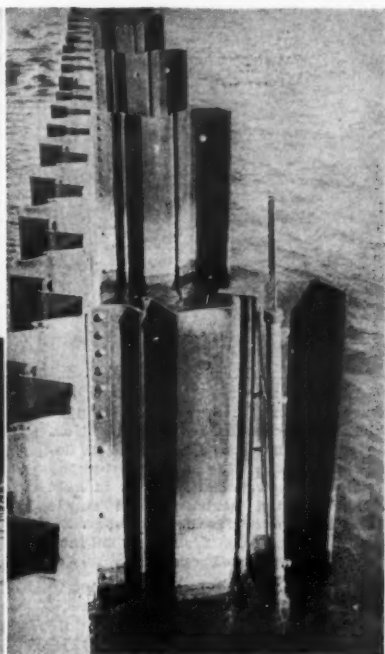
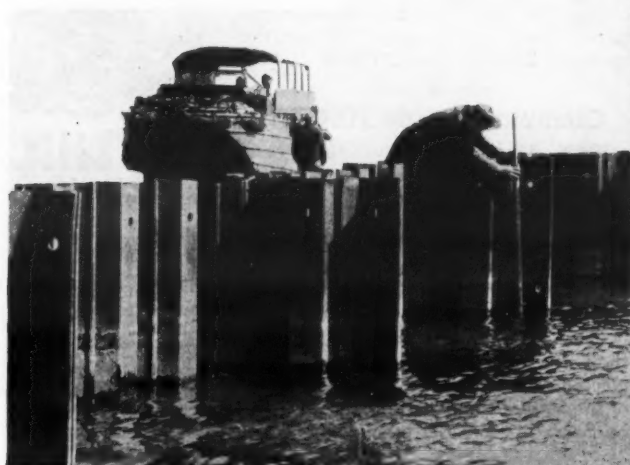


DEPTH MACHINE. In the photo at left, Miller's hand is on the "sensitivity" control of the depth machine. The chart is being produced on a rotating drum under the glass window. The black button at the lower left corner of the machine "shorts" a line across the chart for information such as bearings. Inside the machine (photo above) is a constant-speed motor which drives the drum under the metallized-paper strip at left. Above the motor is the oscillator tube which sends 300 supersonic waves a minute to the bottom of the lake.



DEPTH CHART. A section of the chart shows the lake-bottom depth. Heavy numbers at the right are lake-bottom depth. Other columns of figures can be used for bearings, test results, etc.

New Survey Method



PRELIMINARIES. Meanwhile, members of the U. S. Engineers survey party—several of whom are Coast Guardsmen—establish a position on this breakwater for setting the water-depth gage. One of the transit points for the range is at the shore end of the breakwater.

WATER-DEPTH READINGS. While the Duck waits to run the first range of the day, Chief of Party W. H. Hornberger places the water-gage tube on the sheet-piling breakwater. The close-up at right shows the gage in detail. Crew members designed it, as well as many other gadgets used to increase the efficiency of the work. Readings are made on it every 5 minutes while the Duck is on the range, to relate the Duck's chart to low-water datum of the lake.



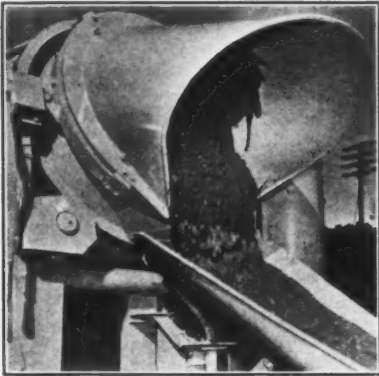
SEXTANT READINGS. In the stern of the Duck, looking towards shore, sextant reader C. A. Deneau takes a bearing to show water's surface. In the background the transit, which is at the foot of the power-line poles, and the range reader George Johnson standing by the breakwater. Out on the range, Deneau takes a sextant reading of two predetermined shore objects every 5 minutes.

ON THE RANGE. Sam Miller operates the depth-sounding machine. Its sending and receiving cones are welded to the inside bottom of the steel hull approximately under his left arm, and heavy wires extend from them up to the machine. R. B. McGarvey, Duck operator, checks his position on the range by mirror. He will stand up soon and steer backwards, facing the transit signal light.



BOTTOM SAMPLES. A mile out on the range, all crew members are in action: John Cook, at left, Hornberger's assistant, has just brought up a bottom sample in a self-tripping grapple; Hornberger places it in a numbered jar for future reference; while Miller keeps check on the chart and McGarvey watches the signal light in the mirror.

THE RETURN. The Duck is now coming back in on a range. While Chief Hornberger uses a three-arm protractor to plot a sextant bearing on the range, Deneau—now in the front right cockpit looking towards shore—takes a sextant reading. The Duck went out on one range, in on another, running four to six of them on a calm day.



The Blaw-Knox Hi-Boy Trukmixer discharges through its revolving hopper which is now in an inverted position. The hopper has been rotated 180 degrees from charging position by the mixing-drum movement and it is held in the inverted position by a single latch. The concrete is discharged quickly and completely from the 32-inch unrestricted opening.

Truck-Mixer Feature Is Revolving Hopper

A truck-mixer of the high-discharge type is now in regular production at the plant of the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh 22, Pa. Known as the Hi-Boy Trukmixer, it features a revolving hopper which is used for both charging and discharge.

The hopper is supported directly from the end of the mixing-drum cone and is said to move with the drum independently of the truck frame. According to the manufacturer, a tight and enduring seal exists between the hopper and drum; this prevents grout leakage, reduces maintenance costs, and avoids long lay-ups for repairs.

During charging, the hopper is held in an upright position by a latch which keeps it from rotating with the mixing drum. During discharge, the hopper is allowed to rotate through 180 degrees, where it is again held in an inverted position by the latch. The hopper latches automatically in these positions.

Construction of the hopper provides a 32-inch unrestricted opening for charging; at the same time, it contains its own confining chute for accurate discharging when in the inverted position. This is said to permit increased discharge height without requiring excessive overall clearance. Supporting brackets for the chute fold out of the way when not in use, and the long chute is carried on the side of the mixer where it is readily accessible.

The lever for controlling the hopper latch is accessible from either mixer catwalk or the ground; so is the main clutch lever for starting, stopping, or reversing the mixing drum. An inspection hatch is provided. The two-compartment water tank is said to be splashproof and of the automatic-over-flow type.

A thorough job of mixing plus a uniform mix from beginning to end of the batch are claimed for the unit. It is reported to discharge rapidly without segregation and to discharge low-slump concrete satisfactorily. The Hi-Boy is made in standard sizes of 2, 3, and 4½ cubic yards; the corresponding capacities when it is used as an agitator are 3, 4¼, and 6½ cubic yards.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 34.

First-Aid Kits, Cabinets

It is important that you be prepared to render your workers first-aid assistance at all times. And one of the best preparedness steps is to have enough first-aid kits available, within easy reach, at all places where accidents might occur. A broadside showing a line of first-aid kits and cabinets is now available from the Columbia First Aiders, Division of Columbia Industries, Inc., 5736 No. Western Ave., Chicago 45, Ill.

The Columbia line of kits ranges from the Model A travel kit of 23 units to the Model E industrial steel cabinet with 203 units. The broadside shows a photograph of each kit, with a tabulated list of its contents. The kits are said to be scientifically assembled and medically approved.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 83.

Clemmer Heads HECAS

H. F. Clemmer was elected President of the Highway Engineers of the Central Atlantic States at its annual meeting held in Wilmington, Del. Mr. Clemmer is Materials Engineer of the District of Columbia, and General Chairman of the American Road Builders' Association's technical committees.

P. E. Masheter, Design Engineer for the Ohio Department of Highways, was elected Vice President. H. C. Headley of the Public Roads Administration will be Secretary for the coming year.

IN THE SPOTLIGHT



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Up-to-date highways need modern guard rail protection. Here's why it will pay you to install the TUTHILL Guard Rail:

Saves lives. The springy, convex rail keeps cars from going off the road. At night, too, it shows up clearly under headlights, plainly marking the course of the road.

Saves dollars. The one-piece, weatherproof Tuthill Guard Rail is simplicity itself. Easy and quick to erect. Never can sag. Requires little or no maintenance.

Be wise. Select the Tuthill Guard Rail for your highway installations.

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Contractors all over the country use C. I. T. funds to buy construction equipment. In this way they avoid tying up too much working capital and are left free to use their money for day-to-day operating expenses.

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The soundness of budgeting equipment purchases is borne out by the numerous comments we receive. For instance, contractors say:

"I needed additional equipment to handle the contract just awarded me, but it was difficult for me to pay all cash. Your financing plan solved my

problem immediately."

"I need some new equipment costing \$24,000, and I'd like to have C. I. T. finance it for me."

"Now I can afford to buy better equipment because your plan permits me to spread the cost over several months."

"The machinery I financed through C. I. T. has paid for itself out of increased earning capacity. Thanks for your assistance."

When you buy construction machinery and equipment, remember that C. I. T. is a dependable source from which you can obtain financial assistance. Just tell us what you want to buy, the balance to be financed and how you want to pay for it. We'll cooperate with you or your distributor to arrange all further details. Ask any of these offices for complete information.

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How Work Active In Revenues Soar

Alert County Begins Big 50-Mile Annual Schedule Of Highway Construction With Federal Aid

+ FINE new county roads have been under construction in Stutsman County, North Dakota, this year. Helped by Federal-Aid secondary-road funds, the program is energetic and well conceived. The County has bought new equipment and is doing the work with its own forces. The year 1947 has been a sort of trial run, but next year and each year succeeding, these alert people hope to build 50 more miles of modern new road.

If a personal note may be injected, this writer knows of no other community where construction of county roads reflects so accurately the honest character of its people. For the dry depression years of 1932-36 are still vividly fresh in the minds of these people. Those were the years when seed and labor came to nothing; when finally there was no more seed to plant. Farmers mowed thistle then—for it was the only thing alive—and tried to carry their milk cows through the winter.

These people can tell you how their horses starved to death those awful winters, and how in the last days of their starving they hobbled up to the farmhouse windows and looked in pitifully at the occupants, begging—if animals talk—for something to eat.

Taxes ate up the farms, and the sheriff had plenty of real estate to sell. But somehow the county forgot to get around to that sorry business, for its land is its wealth and there might come another day. . . . The tenants stayed on.

And now that day has come. The last few years have been good. This year, rippling wheat stretched for miles. Short-grain crops were excellent, and farmers fattened cattle on hay alone, making prime beef.

Here is the character of a people: all those delinquent taxes have come in. Honest people, farmers in their sixties, with gnarled work-worn hands, scrawled forgotten signatures again on checks that were as good as the word of men who wrote them. If they had not been progressive enough to build even one mile of new road, we could still salute them for their character, for they deserve much credit for staying with the fight.

But they are building highways—that's the point—and a fine new modern high school for Jamestown, and a host of other projects. One of the first things they told the five-man Board of County Commissioners was, "Let's build some new highways to the best modern rural standard, while we have the money to do it."

Program Gets Under Way

Tentative plans as drawn call for 50 miles of new roads per year. Some will be built in new locations; others, where possible, will follow existing

routes. Many of the old roads were built straight to start with, and now need only to be enlarged to a wider section.

With contract prices high, the five commissioners decided to go it themselves. The County would act as its own contractor. Orders were placed in 1946 for new equipment to start things moving, and while many a county was still debating its roads in the plans stage, Stutsman County's machines were being delivered.

Working during the past season were three new Allis-Chalmers HD-14 tractors, a new D8 Caterpillar, a new Heil earth-mover, two LeTourneau Carryalls, and an Austin-Western 99-M motor grader. Still to come, but expected when CONTRACTORS AND ENGINEERS MONTHLY's Western Editor visited this county, were a new Pioneer rock crusher, more trucks, three new Caterpillar D8's and a new Lima Paymaster shovel.

Projects have been under way, perhaps not as intensively as planned but

nonetheless active. Two short grading jobs have been finished near Spiritwood Lake, and the gravel topping is on according to Public Roads Administration standards. By the end of this year, something slightly less than half the 50 miles they had figured on will be a reality. But it is something tangible, something more than a mere blueprint. It is the start of a new network of Stutsman County highways.

Approved Plans Followed

The new roads are being built according to PRA-approved State Highway Department plans and specifications. Up to a certain estimated price, the Highway Act of 1944 commits the Government to share one-half the cost of construction of secondary roads. The total cost of ordinary grading here is from \$1,200 to \$1,300 per mile by county forces. Gravel topping costs 10 cents per cubic yard per mile up to 3 miles, and 8 cents per yard-mile over the 3-mile distance. Corrugated or concrete culvert pipes are extras, and are split



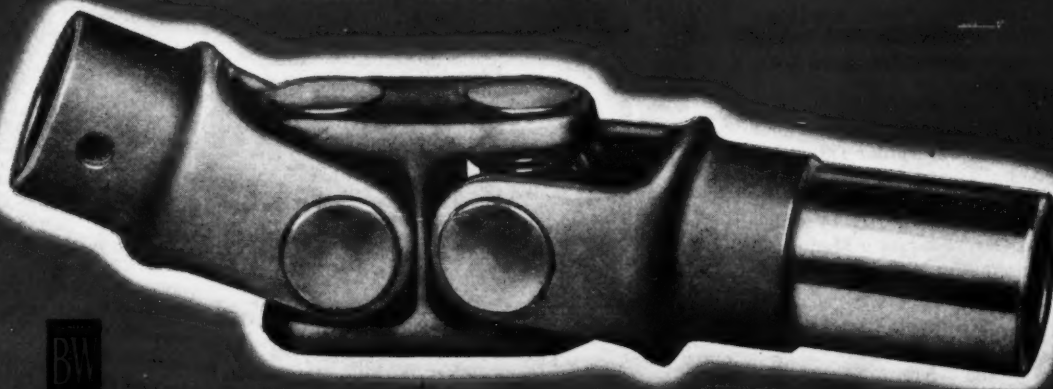
C. & E. M. Photo
One Stutsman County 1947 project involved enlarging the county road from Ypsilanti, N. Dak., west 7.6 miles. A Model 99-M Austin-Western motor grader is shown here shaping up the top of roadway on that job.

according to invoice.

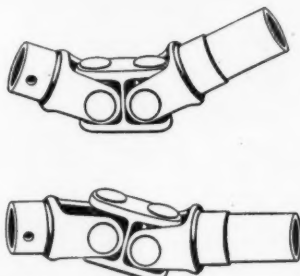
The county construction forces plan their grading to meet the new streamlined section standards, and to keep within estimated costs while so doing. The Board of County Commissioners has engaged Nels Skaar as Project

(Continued on next page)

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...by specifying close-coupled type MECHANICS Roller Bearing UNIVERSAL JOINTS for your new models. This type consists of two universal joints, closely coupled together in a compact unit which compensates for up to 1/2 inch misalignment of shafts. Our engineers will be glad to show you how this MECHANICS close-coupled Roller Bearing UNIVERSAL JOINT application saves space and expense. Our new catalog—showing the complete line of MECHANICS Roller Bearing UNIVERSAL JOINTS—will be sent to manufacturers upon request.



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AMERICAN
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Sidney, Ohio

Road Work Active As Revenues Soar

(Continued from preceding page)

Engineer and put the field supervision in charge of Elmer Hovland, an experienced grading man familiar with equipment.

Skaar prepares a suggested profile at each station, and the cuts or fills are staked in the field by Hovland ahead of the equipment. Paul Legler, the County Engineer, keeps a watchful eye over the entire construction proceedings to see that lines and grades are followed as planned.

The Board of Commissioners, many with more than 20 years of service in their posts, are working together in close harmony with each other and with the Highway Department and PRA representatives to make this a success. H. A. Riebe, Christ Fluetsch, A. C. Gehlhar, William Krekow, and Jack McCarthy are the five Commissioners, and the fact that active construction is now under way is a credit to their working together and agreeing where the first roads should be built.

New Road Pushed Hard

One of this year's projects was an enlargement of the existing county road from Ypsilanti, N. Dak., west 7.6 miles. Its grade was raised through a boggy section. One long hill was largely eliminated by deepening the cut and filling the bog at the foot of the hill about 11 feet deep. The old road was widened to 28 feet, and a riding surface of 1,300 cubic yards of gravel to the mile was placed.

Because the hill excavation was considerably heavier than most grading anywhere in the locality, the PRA contributed 15 cents per cubic yard for the earth that had to be dug.

This hill cut, and the fill below it, were graded off entirely by tractor equipment. A new Caterpillar D8 with a LeTourneau 14-yard Carryall, an Allis-Chalmers HD-14 with a new Heil scraper, an Allis-Chalmers HD-14 with a LeTourneau Carryall, and a Model L Allis-Chalmers-mounted bulldozer cut



C. & E. M. Photo
Direct excavation and casting are done at high speed on Stutsman County roads by this Caterpillar-drawn Adams grader.

this hill and made the new grade.

With a 1,200-foot one-way haul involved, the machines made this excavation a straight cut, haul, and dump operation. The dirt was dumped in lifts about 8 inches thick, and whatever compaction the machines themselves gave was used to stabilize the fill. Undoubtedly there will be some settlement during the rainy period of this autumn

and next spring, but not so much that the gravel surface cannot hold traffic nicely.

On the straight sections the new construction was pushed ahead rapidly. Here, where new construction was a matter of widening and raising the existing road from borrow within the right-of-way lines, operations were fully mechanized.

A new Allis-Chalmers HD-14 with an Adams 24-inch elevating grader rooted the soil from the borrow pit and cast it up either on the road surface or against the shoulders to widen the highway. A Model 99-M Austin-Western motor grader, working on top of the old highway, kept the grader-cast material smooth enough to maintain traffic through construction, and was used to shape the embankment.

Out at the right-of-way edge a Model 70 Caterpillar tractor with a Russell pulled grader, both long in the service of Stutsman County, rolled earth over within reach of the elevating grader. In this manner, the dirt was handled

rapidly and wholly by machines. By working a length from 1/2 to 1 mile long, depending on the amount of earth to move, the machines built new embankment rapidly.

The County has had considerable difficulty getting corrugated-metal pipe for culverts. It finds it best always to put culverts in before dirt work starts, even if it means substituting for concrete or a different gage. If a fill is trenched to install pipe after the job is done, a bump invariably results long afterward; then too, of course, the trench is costly work.

New embankments are shaped up with 4 to 1 front slopes and some 2 to 1 backslopes. The country is so generally flat or rolling that this streamlined design should lessen the amount of snow-removal work necessary. For example, last winter Stutsman County spent \$25,000 for snow removal. If better slope designs on new roads eliminates part of this work, some of the cost will certainly have been justified from that

(Concluded on next page)



America's Most Complete Line of Material Handling Buckets

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• FRONTS, BOTTOMS, SCOOPS AND TEETH are 14% manganese steel developing tensile strength up to 120,000 p.s.i. This high percentage manganese steel gives tough, rugged strength for hard service and allows wide set corner teeth for easy entrance in digging. Volume production methods enable us to build a better bucket with amazing economies in manufacturing.

Experience Counts

See your shovel man or equipment dealer about PMCO Buckets and Dippers.

On the 1/2 yd. and 3/4 yd. Shovel, Pullshovel and Dragline Buckets, all teeth are interchangeable—a great advantage to operators.

Clamshell
Sizes 3/8, 1/2, 3/4, 1, 1 1/2, 2 yds.



Pullshovel
Outside Cutter Widths: 26"—31"—36"—39"



Shovel
Sizes 3/8 to 18 yds.



Dragline
All Purpose and Perforated
Sizes 3/8 to 2 yds.
Stripping sizes 2 to 9 yds.

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Attachment of tester is by means of interchangeable adapter which takes place of fuel injector. In addition to a "universal adapter" which serves more than 50 makes and types of Diesels, we have a complete line of special adapters for practically every commonly-used Diesel engine. Write for a copy of descriptive Leaflet 605.

ATTENTION! Distributors: Diesel equipment and accessory jobbers are invited to write for information about attractive distribution proposition.

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standpoint alone.

Paul Legler's County Engineer office is full of new plans. The Commissioners are full of enthusiasm. Nothing can halt this program now, it appears. Genial Commissioner Christ Fluetsch, who has a thriving insurance business in Jamestown, makes a dozen telephone calls a day about the business of building roads, as do the other Commissioners in their parts of the second-largest county in North Dakota.

Good operators are running the new equipment. Those machines are being taken care of as if they belonged personally to the men who run them. Down at the big hill cut, you could see an example of this. There were two fuel tanks on the job. One contained a fine, light grade of fuel for the General Motors two-cycle diesel engines of the Allis-Chalmers tractors. The other was filled with a good heavier grade for the four-cycle Caterpillar engines.

Shop facilities are small, but a traveling hoist has been installed to speed any heavy repairs necessary. Parts are still hard to get, but the shortage is easing. The new machines are given every kind of service attention recommended by their manufacturers. Working a 10½-hour shift, the job saw about 9¼ hours of active machine time each day. The machines were fueled and greased every day during the lunch period.

The attitude of the machine operators is as enthusiastic as the commissioners'. One young catskiner, complimented on the speed and the full load he made each trip, said, "Well mister, we didn't get much done this year but we'll give it hell next year!"

It would seem that they will.

Torque-Indicator Wrench

Six of its torque-indicator wrenches are listed in a new catalog being distributed by the Blackhawk Mfg. Co., 5535 W. Rogers St., Milwaukee 1, Wis. Torque indicators (tension wrenches) are, in effect, socket-wrench handles which measure the amount of pull exerted by the workman. They are said to enable uniform tension on a series of bolts, to prevent distortion of the assembly. Blackhawk torque indicators are made in ranges up to 1,000 foot-pounds.

Bulletin No. 46-T illustrates and describes the Model No. 49969 175-foot-pound torque indicator; the Model No. 69969, with a capacity of 420 foot-

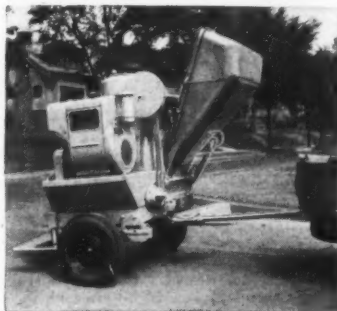
pounds; and the model No. 89969 whose capacity is 1,000 foot-pounds. Also listed and described are the Torkflash Models No. 39968, No. 39975, and No. 49975. The Torkflash indicator flashes a signal when the desired pull is reached, as set manually on the tension scale.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 19.

Small Concrete Mixer

A one-bag concrete mixer has been brought out by the T. L. Smith Co., 2835 No. 32nd St., Milwaukee, Wis. Christened the 6-S Trailsmith, it is designed for speed on the job and en route to it. It is said to have balanced lightweight construction, low center of gravity, and auto-type leaf springs. It is available with choice of engine and wheels, with or without a batch meter and a self-priming pump.

Some of the features listed for this mixer by the manufacturer are: automatic high-frequency skip vibrator;



Christened the 6-S Trailsmith, this one-bag concrete mixer is designed for speed on and en route to the job. It is available with choice of engine and wheels; batch meter and self-priming pump optional.

multiple V-belt drive; enclosed gear-reduction unit with machine-cut gears running in oil; anti-friction bearings; shock-absorbing cantilever spring suspension; pneumatic tires; accurate easy-to-reach water-measuring tank; collapsible tow bar and pivoted support bracket; and fast end loading and

end discharge. Levers are centralized for convenient operation.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 38.

New Hydraulic Loader

A hydraulic loader for rubber-tired tractors is available from the Industrial Equipment Co., 4441 Santa Fe Ave., Los Angeles 11, Calif. It is of the front-end type. Features claimed for the Reese loader include maximum lift, simplified construction, increased visibility, ease of operation, and maneuverability.

Buckets for the loader are available in three sizes: ½, ¾, and 1 cubic yard struck measure. Dumping clearance is said to be over 90 inches to permit heap-loading of standard-size trucks. Attachments for use with this machine include a backfill blade, fork lift, booms, and scarifier-rippers.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 14.

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This new overhead loading attachment—the Marmach—is made by Marion Machine Co. of Marion, N. C., for use with the International Model I-8 wheel tractor. It requires no turning of the tractor, the manufacturer points out; consequently loading is said to be accomplished unusually fast and in close working space.

Army Reserve Units Allotted to the AGC

The Associated General Contractors of America has been allotted 100 Affiliated Units in the Organized Reserve Corps by the Department of the Army. The Association was invited by the Department to sponsor the principal reserve construction units needed by the Army in its newly announced Affiliation Program. Under this program, reserve units are sponsored by civilian organizations performing functions closely allied to the units' projected military assignment.

The units to be sponsored by the AGC include Construction Battalions; Aviation Engineer Battalions; and Headquarters and Headquarters Companies of Engineer Construction Groups, Aviation Engineer, and Engineer Port Construction and Repair Groups.

Initial emphasis will be placed on formation of Class C units, consisting of a minimum of 60 per cent of authorized officer strength. Progressively, these are to be expanded into Class B units, consisting of a minimum of 80 per cent of authorized officer strength and a cadre of key enlisted men; and Class A units, consisting of a minimum of 80 per cent officer strength and 40 per cent of authorized enlisted personnel.

The Headquarters and Headquarters Company of Engineer Construction Groups will provide staff supervision over three to six engineer construction battalions. The Headquarters and Headquarters Company of Engineer Port Construction and Repair Groups will furnish skilled technical specialists, supervisors, and equipment needed to construct and repair water-front establishments and harbor facilities. The mission of the Engineer Construction Battalions is to perform general engineering work such as road and railroad construction, port rehabilitation, and camp and hospital construction.

The Engineer Aviation Battalions will be trained to construct, rehabilitate, maintain and camouflage, and assist in the defense of air bases in the theater

of operations. The mission of the Headquarters and Headquarters and Service Company, Engineer Aviation Groups, will be to construct and maintain air-

fields in a theater of operations; and to furnish centralized control over planning operations and supply of construction material and equipment for three to six battalions in an overseas theater.

The Affiliation Program's plan is to prepare the United States for the event of another war which could easily start with an immediate attack on this country. The sponsors have the responsibility, insofar as possible, of maintaining the authorized strength of the unit at all times with qualified personnel. Training equipment will be furnished by the Army. Currently, personnel is limited to members of the Officers and Enlisted Reserve Corps, which consist of men with at least six months of service in World War II, except for certain specialists who may become reserve officers on Army approval. The Army is studying plans to open the Reserve to non-veterans. It has also introduced bills in Congress which would provide inactive-duty training pay on a basis similar to that now applicable to the National Guard.

Catalog on V-Belt Drives

A 384-page pocket-size catalog describing its equipment for V-belt drives has been prepared by The Dayton Rubber Co., 10 Rubber St., Dayton 1, Ohio. It is arranged to provide a convenient reference for quick and easy selections. It contains information on V-belt drives, V-flat drives, supplementary-drive tables, engineering data for special drives, prices and dimensions, and an interchangeability list.

Some of the subjects covered in Catalog No. 280 are the advantages of V-belt drives; typical V-belt-drive installations; double-angle V-belts; and engineering data on installation, handling, designing, etc.

The catalog contains a complete listing of all the units in the line, their sizes and dimensions, prices, and other information for users of this type of equipment.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 67.



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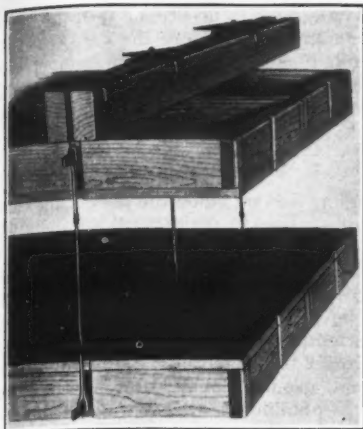
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In the new Symons system of hook-up for panel forms, the rods are anchored from the sides of the panel. They hold both ways and do not pass through. Instead of spreader washers, the tie rods have looped ends through which the connecting bolt between adjacent panels is passed, thus making a combined spreader and tie.

Panel-Form Hook-Up

A new system of hook-up for panel forms has been announced by the Symons Clamp & Mfg. Co., 4251 W. Diversey Ave., Chicago 39, Ill. Using standard panel forms, this system is said to save as much as 50 per cent on labor costs. Symons forms are available on a rental basis, or for sale.

With this system, the tie rods are anchored from the sides of the panels; they hold both ways and do not pass through. According to the manufacturer, after the connecting bolt—to which the ties are anchored—is removed, the forms may be lifted straight up or back; they do not have to be forced away and disengaged from protruding ties and washers.

The tie rods have the break-back feature, and instead of spreader washers they have looped ends through which the connecting bolt between adjacent panels is passed, making a combined spreader and tie. The manufacturer points out that no nailing of band-iron ties or adjusting of washer ties is necessary; this eliminates the need for measuring and cutting band iron. Connecting or anchor bolts are placed a specific distance from the concrete surface.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 97.

Fire-Resistant Paint

A paint which resists fire has been developed by Plicote, Inc., Division of Watson-Standard Co., Galveston and Stepler Sts., Pittsburgh 30, Pa. According to the manufacturer, when a wall covered with its Fire Stop paint was subjected to the 3,000-degree F blue flame of a Bunsen burner, the wall merely formed brown blisters; and the flames which developed extinguished themselves in from 8 to 15 seconds after the burner was removed.

The company states that no finish or coating is proof against big fires. But it does claim that its paint will prevent many serious fires by stopping small fires before they spread. It is a flat wall oil-base ready mixed washable finish. It is made in five colors and white.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 28.

Chloride-Group Conference

With technical representatives of all four member companies attending, the Calcium Chloride Association of Washington, D. C., recently held a 3-day conference at Uniontown, Pa. The meeting was under the supervision of G. H. Kimber, Managing Director of the Association.

Reports were presented on the use of calcium chloride as an admixture in

concrete, its use in road soils, and its use for ice control, surface consolidation, and bases. A highlight of the gathering was a trip to the West Virginia University Laboratory at Morgantown, W. Va., to witness Association research in progress there.

Literature on Snow Plows

Literature on its line of snow plows and snow movers has been prepared by the Arps Corp., New Holstein, Wis. The Blackhawk line of plows includes V and straight-blade types for mounting on tractor or Jeep, and a special model of snow mover and terracer. The tractor-mounted units are built for Farmall tractors, Models A, H, and M.

The folders show the plows mounted and in use. Text describes what these plows will accomplish, and their features. Complete specifications are listed for each model of plow.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 73.



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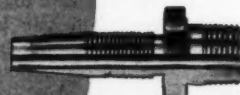
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Concrete Flood Wall Is Built on Sheet Piles

Will Protect Industrial Area; Wood Forms Lined With Absorptive Material; Has Five Service Gates

★ A REINFORCED-CONCRETE flood wall, 2,800 feet long, has been built to protect an important industrial area near the north city limits of Memphis, Tenn., from high water on the Mississippi River. It was built as a flood-control project of the Department of the Army, Corps of Engineers. The straight-stem 12-foot-high wall was constructed over a row of steel sheet piling which projects 3 feet into the concrete. Absorptive lining material was used with wooden forms for a dual purpose—to give the wall a smooth, dense finish, and also to cure the concrete. An air-entraining agent for the cement was employed in the mix.

The job was awarded by the Corps of Engineers, Memphis District, to Ottinger Bros. of Oklahoma City, Okla., on its low bid of \$300,541.60. The project got under way in March and was completed in September. The wall was built about 300 feet back from Wolf River which flows into the Mississippi at Memphis. Flood danger results when the Mississippi is high, and backs up into the Wolf River tributary. Safety will be further increased when a new channel is completed for Wolf River, which will place that stream about 1,000 feet away from the new wall. This channel is partially completed at the present time.

Industrial Area

The industrial area that the wall protects includes a large plant where airplanes were turned out during the war. This has since been converted to peacetime production, and is now occupied by the Kimberly-Clark Corp. Another large factory behind the wall is the Memphis Cotton Oil Mill.

The wall is far from straight as it follows the course of the river in a series of straight lines. On the west it ties in to an old concrete wall and on the east to an earth levee. The gap between, now filled by the wall, depended on fairly high ground for protection against high water. Its security was threatened,

however, in the 1937 flood when the waters rose 50.4 feet above zero on the Memphis Engineer gage, or to elevation 234.6. As the elevation of the top of the new wall runs from 243.5 to 243.8, it should turn back any future flood stages on the Mississippi.

Because of the industrial nature of the area behind the wall, five openings had to be left in it so that the plants would not be closed off without a northern access. One of the openings is for the main-line tracks of the Illinois Central Railroad going into Memphis. Four of the openings in the wall are closed with structural-steel rolling-type flood gates with a rubber seal; one is closed by stop-logs. Three of the gates measure 13 x 20 feet, one is 14 feet 9 inches x 20 feet, and the fifth is 8 feet



C. & E. M. Photo

Looking west along Ottinger Bros. flood-wall job, we see in the foreground (1) timber piles used for flood-gate foundation, then (2) Z-type steel sheet piling, and behind that (3) a Northwest dragline excavating for the railroad floodgate in the wall, and a Bucyrus-Erie 41-B steam rig preparing to drive another timber pile.

3 inches x 6 feet. In the case of the railroad opening, the track and ballast

would have to be lifted out in the event of high water before the gate could be rolled shut. The construction of this gate also posed some problems since the longest interval between trains is only 3½ hours.

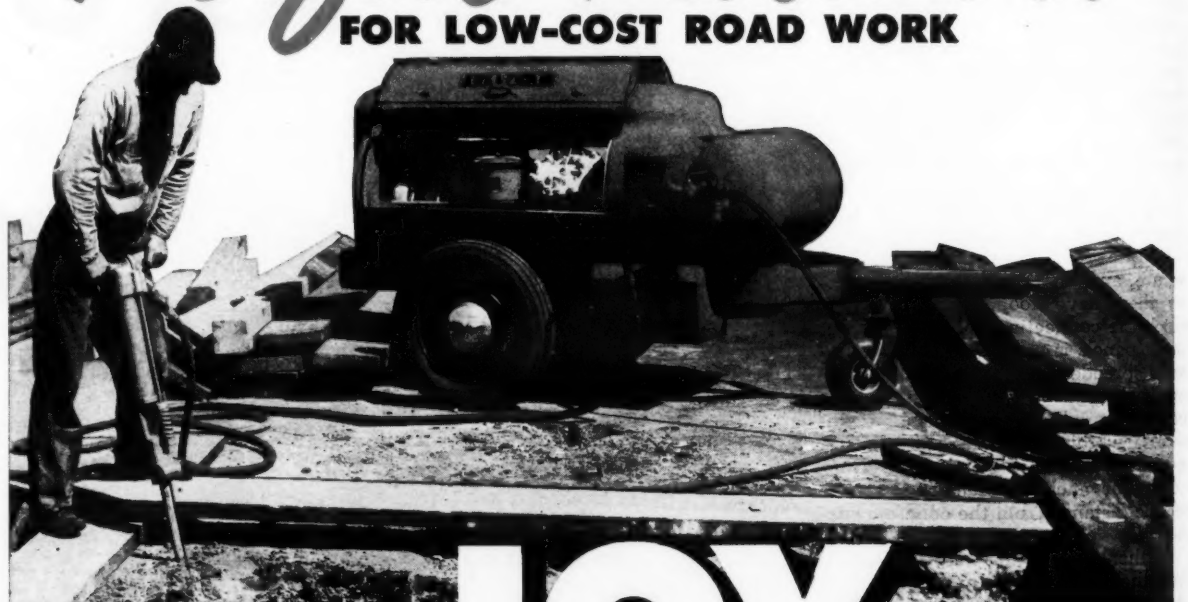
Sheet-Pile Foundation

The first move on the part of the contractor was to make a fill all along the line of the new wall, since the plans called for the construction of a 10-foot gravel road in back of the flood wall. The fill was made about 21 feet wide, extending out in front of the wall, and from 2 to 2½ feet higher than the original ground level. Borrow material was obtained by excavating at the site of the Cypress Creek Reservoir in Memphis.

On a job of this kind where heavy equipment was not in continual operation, the contractor usually rented cranes and shovels as the need for them developed. Hence many different types of rigs saw service on the project from

(Continued on next page)

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MIDGET No. 1—1/4" chain.....	2 1/2	lbs.
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Durbin-Boomer F-1—for 3/8" chain..... 10 lbs.
Durbin-Boomer F-2—for 1/2" or 3/8" chain..... 12 lbs.

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time to time. For this preliminary earth work, the contractor used an Insley 5/8-yard dragline with a 45-foot boom, with dump trucks for hauling the material.

As the trucks dumped the material down the center line, a Caterpillar D7 tractor-dozer spread it out in 6-inch layers. The dirt was well compacted from the trucks passing over the fill and from the passes of the dozer. After the fill was completed, a Northwest dragline with a 40-foot boom and a Hendrix 5/8-yard bucket dug a trench riverward of the gravel road bed, 5 feet wide and 4 feet deep; into this the steel sheet piling was then driven.

All the sheet piling which went under the wall is the Z-type, mostly MZ-32, furnished by the Tennessee Coal, Iron, & Railroad Co., a subsidiary of Carnegie Steel Corp. The material came from the latter's Pittsburgh plant, and was shipped down the Ohio and Mississippi Rivers on barges. At Memphis it was unloaded to railroad flatcars and moved to the siding of the Illinois Central Railroad within the plant grounds of the Kimberly-Clark Corp. There the steel was unloaded by crane and hauled on trailer trucks an average of 1/4 mile to the project.

A McKiernan-Terry No. 7 steam hammer drove the sheet piling into the loess-type soil. The hammer was handled by a Bucyrus-Erie 41-B steam crane with a 45-foot boom. The rig was outfitted with two side racks to keep the piling in line. On the hammer head was a flat anvil base so that two piles could be driven at the same time. The piling was driven to a grade so that 3 feet would be left projecting into the bottom of the wall along the center line.

Moment Bars

As the wall is designed without a footing, two vertical moment bars were welded on the face of each pile to resist overturning thrusts—one on the land side and the other on the river side. The bars are 4 feet 7 1/2 inches long, 1 1/4 inches square, and lap the piling 1 1/2 inches. Each bar was secured to the pile by a 4 1/2 to 5 1/4-inch weld made with a Hobart 300-amp electric welder; there were two of these on the job.

The bars also served as a support for the erection of the reinforcing steel, which consisted principally of a mat made of 3/4-inch rods. A mat was placed on each side of the wall, set back 3 inches from the face. Jones & Laughlin Steel Corp. of Pittsburgh supplied the reinforcing steel, shipping it by barge to its Memphis plant where it was bent and cut to size. Trucks delivered it to the job.

Forms and Liner

The flood wall is designed with a base width of 1 foot 11 1/4 inches. From the base the land-side face rises vertically, while the river side of the wall is battered 1 inch in 24. At the top the wall is 1 1/2 feet wide, but is surmounted by a coping 2 feet wide x 1 1/2 feet deep. The average height is 12 feet; however, only about 8 feet of wall is above the surface of the ground, with backfilling completed and the gravel road built in place. The construction is reinforced concrete throughout.

With lumber obtained locally, the wooden forms were built in 12 x 12-foot

panels. Most of the work was done in one of the parking lots of the former aircraft factory, converted into a carpenter yard. The forms were made up of 2 x 6's with butt joints, backed by 2 x 6 studs on 16-inch centers. For horizontal wales double 2 x 6's were used, four being required for the 12-foot-high panels. Another double 2 x 4 wale was placed along the top of the coping. A Mall electric saw and a gas-driven circular table saw with a 14-inch blade eliminated the need for much hand cutting.

When the form panels were completed, they were loaded onto skid rigs. The loading was done with a Braden winch and an 18-foot A-frame mounted at the rear of an International KB-5 truck. A Caterpillar R4 tractor pulled the skids down to the wall. There they were unloaded by a Koehring 205 crane with a 45-foot boom, but before they were erected an absorptive lining was fastened to the face of the forms.

U. S. Rubber Hydron form lining was put on at the last possible moment be-



C. & E. M. Photo

Storm clouds hang over this form work for the U. S. Engineers' concrete flood wall near Memphis. At right is the Jaeger 16-S mixer Ottinger Bros. used. In the background a Koehring 205 crane with a 45-foot boom lowers a form panel into the trench.

fore the forms were set in place so that the material could be kept dry and to eliminate buckling. The absorptive liner is about 1/16 inch thick and comes in 3 x 6-foot panels. If some lining was installed before the panels were ready for use, it was always covered with

taraulins to keep out the moisture. Staples pinned the liner to the forms. They were inserted with a Duo-Fast heavy-duty stapling machine on 6-inch centers both ways, except at the seams where additional staples were fastened

(Continued on next page)

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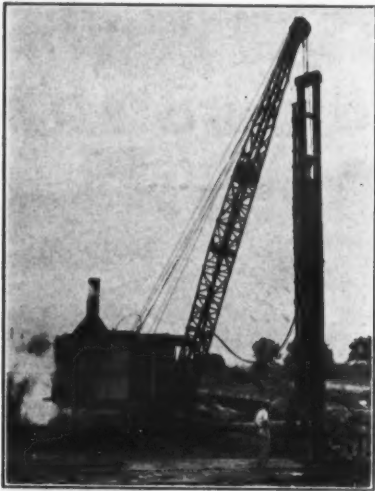
Size	11.4 oz.	12.29 oz.	14.90 oz.	18 oz.
15x20	\$21.00	\$27.00	\$31.75	\$36.07
20x30	42.00	54.00	63.36	68.70

Freight paid on orders of three or more.

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C. & E. M. Photo
Construction features of the Memphis flood wall changed at the gates which were built into it. Here, at the opening for main-line railroad tracks, a Vulcan 300 steam hammer handled by a Bucyrus-Erie 41-B steam rig drives creosoted-timber foundation piles instead of steel sheet piling.

Concrete Flood Wall Is Built on Sheet Piles

(Continued from preceding page)

every 2 or 3 inches. The muslin side of the liner went next to the concrete. The lining material was trimmed with a sharp knife.

Another method was also used to join the liner to the wood forms. A coating of Texaco Marfak No. 3 or No. 5 heavy grease was smeared over the Hydron before it was pressed up against the forms, and stapling was done only at the sides. The grease was intended to repel moisture and thus keep the liner flat and free from wrinkles.

Thanks to lined forms and the use of an air-entraining agent in the concrete to give a more plastic mix, the wall faces are smooth and free of honey-combing. However, extreme care was exercised to keep the liner material dry, for under moist conditions it wrinkled and buckled despite the tight stapling. After the lined forms were set in place by the crane, lanterns were placed within them to absorb the humidity and to prevent swelling and bulging. The wall was poured in alternate monoliths of 35 feet, and usually three lanterns were sufficient to dry out a monolith.

Batch Plant

The forms were held together by Richmond Tyscrus placed from 32 to 40 inches on centers. Outside bracing on

each side consisted of a 2 x 6 nailed to a stake in the ground at 4-foot intervals. With the form preparations complete, the walls were ready to be poured with concrete.

A batch plant had been set up within the grounds of the Kimberly-Clark plant on a siding of the Illinois Central RR. It consisted of a Winslow 35-ton 3-compartment aggregate bin; beam scales weighed out gravel and sand, using two of the compartments for gravel and the third for sand. Actually the mix contained both coarse and fine sand, but the latter was such a small quantity, 17 pounds to the batch, that it was weighed out into paper bags and added separately by hand.

Both the coarse sand and the gravel were furnished by the Wolf River Sand & Gravel Co. of Memphis which delivered the material to the batch plant in railroad cars. A Northwest crane with a 35-foot boom and a Wellman 3/4-yard rehandling clamshell bucket unloaded the aggregate, piling the gravel on one side of the bin and the sand on the other. The crane also kept the bins loaded.

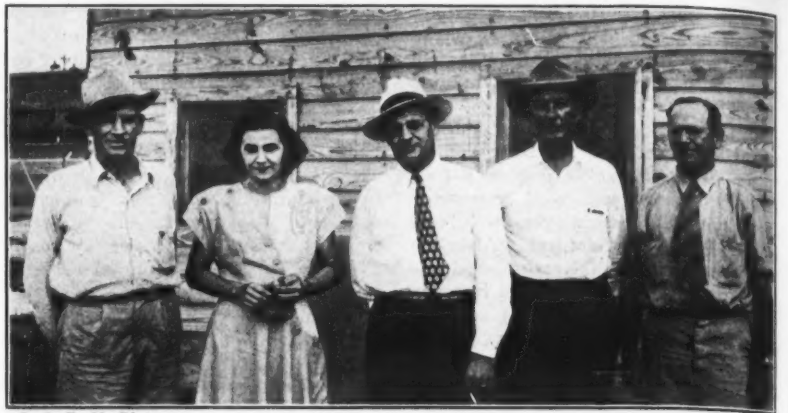
The moderate-heat-of-hardening cement came from the Marquette Cement Mfg. Co. at Cape Girardeau, Mo., which shipped it in cloth bags by rail to the plant.

Two trucks, divided into three compartments, hauled the 1/2-yard batches from the plant to the mixer, an average distance of 1/2 mile. First the trucks picked up the aggregate as the hopper at the plant moved along a framework, stopping under the sand and gravel bins. Then the trucks moved along to the cement house where the bags were opened and the cement dumped in by hand. The fine sand was also added in this manner.

Concrete Handling and Placing

Water was supplied from the city system, and tapped from hydrants at either end of the job. A combination of 1 1/2-inch pipe line and hose with a total length of 1,500 feet serviced the mixer. The water was first admitted to an auxiliary tank with a capacity of 1,350 gallons; this tank was mounted on skids and kept at the mixer. A 1 1/2-inch Jaeger pump transferred the water from the tank to the Jaeger 16-S 3-bag mixer. As water was added to the drum, a measuring device hooked to the control lever admitted 132 cc or 0.28 pint of Darex air-entraining agent automatically to each 3-bag batch.

The mixed concrete was discharged into a Wiley 18-cubic-foot concrete bucket which was lifted to the forms by



C. & E. M. Photo
George Pittaway, General Superintendent in charge of all projects for Ottinger Bros. is at the left in this photo. Next are Mrs. Clyde Ottinger and Clyde L. Ottinger, Business Manager and partner in the firm. Then Paul Graham, Project Superintendent on the flood-wall job, and Douglas Perry, Resident Engineer, Corps of Engineers.

the Koehring crane with the 45-foot boom. No chutes were used. The concrete bucket was emptied into a hopper with a tremie pipe going down to the bottom of the forms. On each 35-foot monolith three hoppers were used to keep the pour even as it was brought up in 18-inch lifts. Two Jackson vibrators were used as the concrete was being placed. Once a monolith was started, pouring continued until the 35-foot section was completed. This usually took from 2 to 2 1/2 hours for an average 27-cubic-yard pour.

The dry weights of a typical batch to which 5 1/2 gallons of water was added per bag of cement were as follows:

Cement	282 lbs.
Coarse sand (97 per cent)	556 lbs.
Fine sand (3 per cent)	17 lbs.
Gravel	1,013 lbs.
Water	137 lbs.
Total	2,005 lbs.

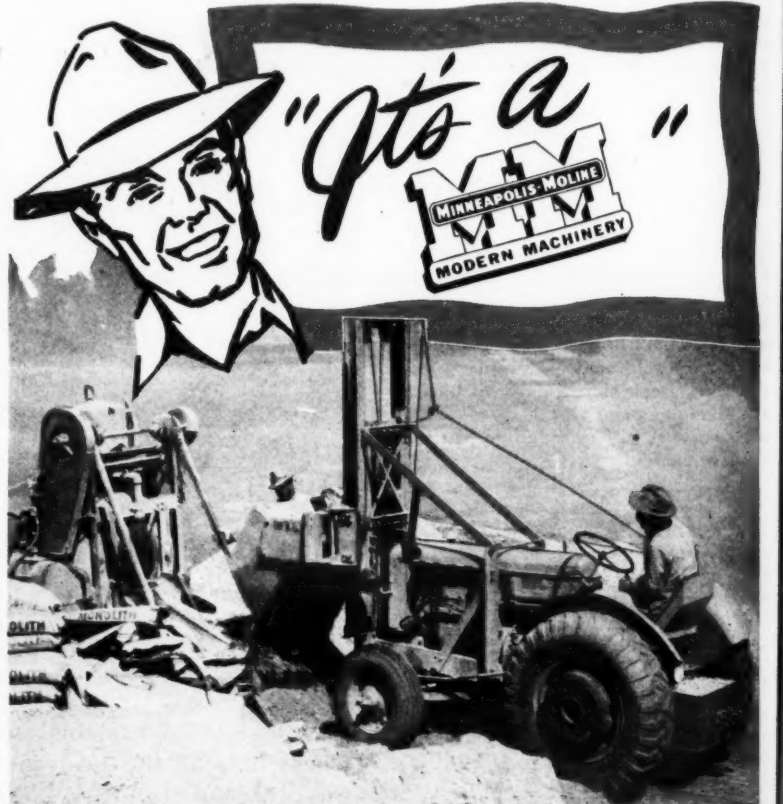
The three types of aggregate had the following gradations:

Sieve Size	Gravel	Per Cent Passing	
		Coarse Sand	Fine Sand
1 1/2-inch	95-100	.....	.....
1-inch	65-85	.....	.....
3/4-inch	40-70	.....	.....
1/2-inch	.....	.....	.....
3/8-inch	10-25	.....	.....
No. 4	0-6	95-100	100
No. 8	.....	80-95	100
No. 16	.....	55-85	99
No. 30	.....	30-60	98
No. 50	.....	12-30	96
No. 100	.....	3 1/2-10	91
No. 200	.....	.....	30

Along the top of the coping, on 4-foot centers, bronze inserts were built into the concrete so that the effective height of the wall might be increased if necessary by adding flash boards.

The top of the wall was curved by spraying with the Hunt Process compound but the sides were cured by the presence of the Hydron liner. While the wooden forms were removed the second day following the pour, the liner adhered to the concrete. The adhesion of the muslin to the masonry increased

(Concluded on next page)



To offer owners year-round utility Minneapolis-Moline has designed the model RTI and UTI tractors to accommodate a wide variety of attachments . . . Dozers, snow plows, material buckets, lifting forks, winches, and many other tools make MM industrial tractors the hardest workers on any construction job . . . New extra heavy duty front wheel and axle construction now provides increased strength for lifting larger pay loads.

See Your Nearest M-M Dealer, Distributor or Write

MINNEAPOLIS-MOLINE
POWER IMPLEMENT COMPANY
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NOT THIS-

BUT This!

with **Silver STEERING BOOSTER**

Fingertip pull on clutch steering levers opens clutches FULL TRAVEL. Ends frequent repairs to clutches, throwout bearings and brakes. Skinners do more and better work because angle-dozing, following contours and steering big crawler tractors does not mean sore muscles and exhaustion at the end of the day. For all crawler tractors. Installed on approval by your dealer.

Silver BOOSTER MANUFACTURING CO.
1406 SOUTH GRAND AVENUE
LOS ANGELES 15, CALIFORNIA
Richmond 8191

the longer it was left on. It was removed, however, not earlier than 14 days after the pour. The muslin was peeled off in 12-inch strips.

Flood Gates

The construction features of the flood wall changed at the gates which were built into it. A foundation for a gate was constructed by driving some 66 treated-timber piles at each location. The piles were 25 feet long, with 11-inch tips and 16-inch butts. They were driven usually on 3-foot centers both ways by a Vulcan 30C steam hammer in swinging leads, suspended from the 45-foot boom of the Bucyrus-Erie 41-B steam crane. They were cut off at a grade that would leave them projecting 10 inches into the 2-foot-thick concrete-slab floor.

Under the concrete gate sill was driven a row of M-115-section 24-foot steel sheet piling. The concrete sill is flanked at either end by a heavy concrete buttress.

An International T-40 tractor-dozzer was used for various purposes, from handling the timber piling to shaping up the site and smoothing over the back fill. Immediately next to the wall the backfill was hand-tamped in place. The rest of the fill was built up in 4-inch layers and compacted by a Schramm backfill tamper powered by a Schramm air compressor.

All the equipment on the job was serviced with Texaco fuel and oil. Two skid rigs, each having a 280-gallon tank, were pulled out to the job by a tractor each morning. One tank contained gasoline and the other diesel fuel. At night they were returned to the contractor's carpenter yard where they were filled from a supply tank truck.

Quantities and Personnel

The major items in the Wolf River flood-wall contract included the following:

Compacted fill	6,700 cu. yds.
Tamped backfill	5,200 cu. yds.
Steel sheet piling, M-115	195,200 lbs.
Steel sheet piling, MZ-32	1,390,000 lbs.
Steel sheet piling, MZ-38	84,700 lbs.
Treated-timber piling	6,300 lin. ft.
Concrete	2,660 cu. yds.
Steel reinforcement	250,000 lbs.
Structural steel	74,600 lbs.
Absorptive form lining	42,000 sq. ft.

A force of 50 men was employed in the construction of the 2,800-foot-long flood wall. For Ottinger Bros. of Oklahoma City, Paul Graham was Project Superintendent. E. C. Ottinger, member of the firm, exercised close supervision over the contract, paying flying visits to the project in his personal plane. George Pittaway is General Superintendent in charge of all projects for Ottinger Bros. Clyde L. Ottinger is partner and Business Manager.

For the Department of the Army, Corps of Engineers, Douglas B. Perry was Resident Engineer. The Memphis Engineer District, which was in charge of the project, is headed by Col. L. H. Foote, District Engineer.

Dealers Named by Maxon

Several new dealer appointments for sales and service of its Dumpcrete bodies have been made by the Maxon Construction Co., Dayton, Ohio. Anderson Equipment Co., Omaha, will cover the state of Nebraska. Banks-Miller Supply Co. of Huntington will have the state of West Virginia, with the exception of the extreme eastern and panhandle counties. J. W. Bartholow Machinery Co., Dallas, has been awarded the northeastern section of Texas. Western Texas has gone to Goodman Bros., of Midland. R. E. Brooks Co., New York City, will have the entire metropolitan area including eleven counties in New Jersey.

Herman M. Brown Co. of Des Moines will cover the state of Iowa. Columbia Equipment Co., of Portland, Oreg., and Seattle, Wash., has been awarded the entire state of Idaho and all of Washington except eight southern counties.

These eight counties, along with the state of Oregon, have been awarded to the Cramer Machinery Co., of Portland. Harry Cornelius Co., Albuquerque, will have the state of New Mexico. Eddy & Co., Lansing, Mich., will have the lower peninsula of the state of Michigan. Frantz Equipment Co., Philadelphia, will cover eight eastern counties in Pennsylvania and southern New Jersey. State Equipment Co., Harrisburg and Kingston, Pa., has thirty-one counties in eastern Pennsylvania, not including the Philadelphia area.

Felix Green Machinery Co., Little Rock, has been awarded the state of Arkansas. C. H. Jones Equipment Co., Salt Lake City, will cover the state of Utah. The Minneapolis Equipment Co., Minneapolis, will have the state of Minnesota; Mitchell-Kennedy Machinery Co., Inc., Phoenix, the state of Arizona; and Nixon Machinery Co., Nashville, the middle third of the state of Tennessee. Tri-State Equipment Co., Inc., Memphis, has that part of Tennessee west of the Tennessee River and

northern Mississippi as far south as Vicksburg, Jackson, and Meridian. The remaining eastern third of Tennessee has gone to the Power Equipment Co. of Knoxville.

The state of North Dakota has gone to Northwestern Equipment, Inc., Fargo. Pecaut Industrial Supply Co., Sioux Falls, will cover the state of South Dakota. O. W. Walvoord Co., Denver, will have the state of Colorado; and

Emmett C. Watson, Louisville, the state of Kentucky except nineteen eastern counties.

Wood Mfg. Sales Manager

B. A. Schimmel has been named Sales Manager of the Wood Mfg. Co., North Hollywood, Calif. The Wood line includes the Roadmixer and other specialized road-building equipment.

BRILLIANT PERFORMANCE EVERY TRIP OUT

is Assured by

DAVENPORT - FRINK SNO-PLOWS



ALL TYPES AND SIZES

No matter what the snow or ice conditions, you obtain FASTER • SAFER • CLEANER snow removal with the lighter, yet stronger, DAVENPORT-FRINK SNO-PLOWS. Available in "V" and Straight Blade types for all sizes of trucks, tractors, road patrols and locomotives. Once you see them at work, you know why they are engineer-preferred throughout the snow belt.

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1000 Islands, CLAYTON, NEW YORK

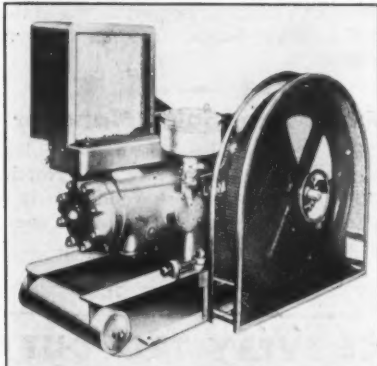
Here's a faster more powerful Barco Portable Gasoline Hammer



Once again Barco comes through with a better Hammer than ever before. In recent demonstrations through the country the new model H6B Barco proved to the hammer experts that it has more speed and power than ever, *at no increase in weight*. Men praised Barco's new carburetor valve—said it was easier to operate. They liked the new method by which the cable is held—makes for easier handling and reduces wear on the cable where it leaves the handle. See the improved Barco Hammer now. You will agree that in speed, power and portability, Barco has no superior. For complete information, write to Barco Manufacturing Company, Not Inc., 1818 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

BARCO PORTABLE HAMMERS • BREAKING • DRILLING
DRIVING • TAMPING



The first model of White-Roth's new line of single-cylinder 2-cycle engines, the Lorain Type L, is now in quantity production. It has a rating of 10.7 hp at 300 rpm and 21.4 hp at 600 rpm. It will operate on diesel fuel, natural gas, or butane.

Heavy-Duty Engines

A line of 2-cycle single-cylinder horizontal engines is announced by the White-Roth Machine Corp., Lorain, Ohio. The first model in the line, the Lorain Type L, will operate on diesel fuel, natural gas, or butane. It has a 7½-inch bore and an 8-inch stroke. The engine has a rating of 10.7 hp at 300 rpm, and 21.4 hp at 600 rpm.

The condenser-type cooling system is said to eliminate the need for a water pump; make-up water is negligible, the manufacturer says. Wet cylinder liners can be replaced in the field. The crankshaft and cross-shaft use Timken bearings. Standard equipment includes a Twin Disc clutch, Pierce governor, Air Maze oil-bath-type cleaner, and McCord lubricator.

The radiator, fan, V-belts, spark plug, and magneto are enclosed in metal guards. Overall dimensions are: height, 52½ inches; length, 70 inches; width, 47¼ inches. Shipping weight is 2,500 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 16.

Penn-Drake Mich. Agents

James S. Emerick has been named sales representative for lower Michigan by the Pennsylvania Refining Co., Cleveland, Ohio, maker of Penn-Drake snow-plow wax and Gumout. Mr. Emerick will cover the city of Detroit and the counties of Wayne, Lapeer, Monroe, Macomb, Ingham, Genesee, St. Clair, Livingston, Jackson, Oakland,

Washtenaw, and Shiawassee. At the same time the appointment of Frank D. Messenger is announced as agent for direct factory sales throughout the lower peninsula. He will maintain headquarters at Fair Haven, Michigan.

Construction Volume, 1947, About Same as in 1939-40

While the estimated need for new construction is approaching the \$21,000,000,000 mark in 1950, the actual volume of construction is at about the same level as in 1939 and 1940, according to James W. Follin, Assistant Administrator of the Federal Works Agency. Addressing the Structural Engineers Association of California at its meeting in Yosemite, Mr. Follin spoke on the question "Can the Construction Industry Fulfill the Nation's Requirements?"

"It is difficult to estimate the physical volume for 1947," he said, "because statistical data are not yet available."

But he referred to the estimates of over \$12,000,000,000 in new construction this year, and said: "Because of the sizable increases in construction costs, I would guess that a round figure of \$6,500,000,000 for this year, in terms of 1939 prices, will come pretty close to the final figures. Actually the physical volume of 1947 construction is probably less than it was in the late 20's, not much over 1931, and about the same as in 1939 and 1940." Or, to put it another way, new construction activity averaged about 10½ per cent of the national income in the 1920-39 period; it is now running but little more than half that rate—in terms of current volume.

He pointed out that while prices, excluding the effects of a depression, may not go back to prewar, they could well level out at about 50 per cent above, some 20 or 30 points less than at present. This could be brought about by greater productivity of management and labor, and the development of better methods and better technology, he said.

Air-Compressor Bulletin

A varied line of air compressors is the subject of a catalog available from the O. K. Clutch & Machinery Co., Columbia, Pa. The line includes single and double-stage compressors powered by gasoline or diesel engines, and mounted on metal wheels, pneumatic tires, or skids. They range in capacity from 85 to 160 cfm.

Specifications listed cover all details of construction and performance of the compressors, of the Hercules engines, and other parts. Construction details especially emphasized in Catalog No. C-47 are those of the cylinder head and block, the crankcase, the connecting rods, crankshaft, bearings, piston and piston rings, air valve, air regulation, air throttle control, lubrication, frame and mounting, air receivers, etc. One section is devoted to the Hercules 6-cylinder gasoline and diesel engines.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 64.



*Built to keep
"a-running!"*

Have you seen the MultiFoote DuoMix 34-E Paver? If you are planning on new paving equipment be sure you see it and get all the details on this unusual double drum equipment.

It's built to keep a-running! It's powerful! It's simple in design! It's fast!

Lift the doors under the deck. You will be amazed at the small amount of machinery. It means easy upkeep—low-cost maintenance. Unusual crawler design with a self-cleaning type of action gives the MultiFoote low ground bearing pressure and makes it light on its feet.

The rotary transfer and discharge; the big, fast-acting skip; the high-speed bucket with its simple outside door action; mean seconds saved in getting the batch to the grade.

Add to this the power-operated superstructure for low clearance, the high operating platform for clear visibility, the no-pressure water system and other MultiFoote advantages, and you can see why it's the smoothest, fastest Double Drum Paver on the road today. Ask for the latest catalog.

THE FOOTE CO., INC.
1916 STATE STREET
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MULTIFOOTE
Duomix 34E
(DUAL DRUM)
CONCRETE PAVERS

Builders of
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General operating mechanism of the DuoMix. Note the simplicity! Few shafts, few gears mean accessibility, easy adjustment, easy maintenance. The MultiFoote is built to keep a-running.



Shunk Snow
Plow
and Ice Removal
BLADES

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

FOR ALL TYPES AND MODELS OF SNOW PLOWS
Various widths, lengths, thicknesses—flat or curved—standard or special—punched ready to fit your machine.

SHUNK SAW-TOOTH ICE BLADE

Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.



Shunk
MANUFACTURING COMPANY
ESTABLISHED 1854
RUCYRUS, OHIO



This Model KBR-14 is International's new heavy-duty off-the-highway truck chassis. It is available in 161, 179, and 215-inch wheelbases.

New Truck-Tractor For Off-Highway Use

A new 4-wheel heavy-duty off-the-highway truck has been announced by the Motor Truck Division of International Harvester Co., 180 No. Michigan Ave., Chicago 1, Ill. Model KBR-14 is designed for use as a truck-tractor or straight truck. Its gross-vehicle-weight rating ranges from 32,000 to 41,600 pounds, and it is available in three wheelbases—161, 179, and 215 inches.

Power for the KBR-14 comes from a 6-cylinder International-Continental R-6586 valve-in-head engine. Bore is 4 13/16 inches; stroke, 5 5/8 inches; piston displacement, 586 cubic inches; and maximum brake horsepower is listed at 200 at 2,600 rpm, with maximum torque of 475 pound-feet at 1,000 rpm. The Cummins HB-600 diesel engine is available as optional equipment. The transmission provides five forward and two reverse speeds. An optional arrangement provides a transmission with five speeds forward and one reverse, with direct drive in fourth and over-drive in fifth.

A Timken U-200 double-reduction rear axle is standard equipment. Also available for this model is the Timken U-300. Steering gear is of the semi-reversible cam and twin-lever type. Air brakes, operated by foot pedal, are standard equipment. Total lining area is 746 square inches. Optional equipment includes cab, tire sizes up to 12.00-24, Budd disk wheels, tachometer and 55-amp generator, etc.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 22.

Metal-Spraying Process

The importance of the metal-spraying process as a maintenance tool is the theme of the October issue of "Metco News", published by the Metallizing Engineering Co., Inc., 38-14 Thirtieth St., Long Island City 1, N. Y. This issue features articles from users giving details of how they have applied the process to their own needs.

The heavy-duty metallizing guns are shown applying coatings of stainless steel, bronze, and 0.25-carbon steel. Photographs and stories also cover the uses of the hand gun for various maintenance jobs. And the section entitled "Technical Talks" describes the new Sprayweld hard-facing method. This method combines the operations of welding and metallizing; the company says it obtains advantages previously not obtainable by either process alone.

Copies of this literature may be secured from the company. Or use the enclosed Request Card. Circle No. 69.

Centerless Belt Grinding

A comprehensive description of its centerless belt grinder has been prepared in folder form by the Porter-Cable Machine Co., 1714 No. Salina St., Syracuse 8, N. Y. Folder No. 656 features the benefits said to be derived from the use of this grinder; illustra-

tions as well as text are used to explain its operation.

Specifications listed for the Model No. L-4 centerless belt grinder include dimensions, capacity, drive, speeds, lubrication, component parts, special parts for ease of operation, standard equipment, and special equipment. These are thoroughly discussed, as are other features claimed for this unit by Porter-Cable.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 20.

Wenzel Distribution Plan

The H. Wenzel Tent & Duck Co., St. Louis, is actively promoting its nationwide distribution system of Para water-proofed tarpaulins for the construction industry. Wenzel Para distribution is exclusively through contractor equipment dealers. It is felt that this enables contractors who are operating at distances from their home offices to obtain Para tarpaulins from local sources.

For Economical ICE CONTROL

SOLVAY CALCIUM CHLORIDE

✓ Stops Skids Quicker

✓ Lasts Longer

✓ Doesn't Freeze in Stock Piles



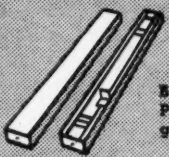
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ALLIED CHEMICAL & DYE CORPORATION

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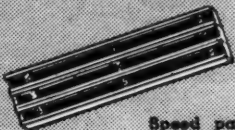
THE A. B. C. of ATLAS Savings



Basic unit, the Speed Panel, made of rugged steel.



Ingenious, quick-action, wedge bolt, for rapid joining or stripping.

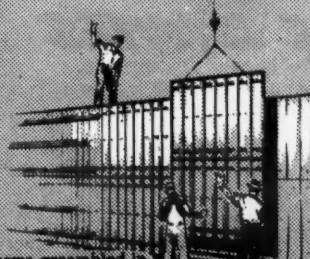


Speed panels combine into units of two or more for quick handling.



Forms are quickly and easily positioned for floors.

Light and sturdy. Easy wall assembly. Rapid stripping.



Forms assembled in multi-unit panels for rapid crane handling.

Cut YOUR ESTIMATE FOR FORM COSTS AND LABOR IN *Half*

if you are going
to use ATLAS FORMS

If the job involves poured concrete, check with Irvington. Remember this:

In poured concrete construction, form costs are 60% of the total costs. And in the average job, the following statement holds true:

ATLAS SPEED FORMS reduce the cost of forms 50%! They reduce the cost of form labor 50%! They cut the time 50%!

If you send us a copy of your plans, we'll be glad to make a layout and estimate. We'll return your plans in three days if you wish. Please use the coupon.

SO LIGHT
A CHILD CAN
LIFT THEM



IRVINGTON FORM & TANK CORPORATION

IRVINGTON 69, NEW YORK

Please send me information on Atlas forms. I am particularly interested in forms for Walls ☐ Floors ☐ Tunnels ☐ Bridges ☐ Sewers ☐ Columns ☐

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43 Cedar Street

Railroad Relocated For Reservoir Project

(Continued from page 1)

and one track on the other side of the plant for cement cars.

The 60-ton aggregate bin is divided into four compartments to hold sand and three different sizes of gravel. All the aggregate came from the Ohio River, and was supplied by the Iron City Sand & Gravel Corp. with headquarters at Pittsburgh. The material was shipped about 50 miles in gondola cars to the plant. There it was unloaded by a Browning 25-ton whirley railroad steam crane equipped with a 60-foot boom and an Owen 1-yard clamshell bucket. Operating on one of the two aggregate-car tracks, the crane stockpiled the material within four shallow wooden barricades adjacent to the tracks. They held respectively 3-inch, 1½-inch, ¾-inch gravel, and sand. Each gravel enclosure held about 15 carloads while the sand accommodated more than 30 carloads. Moving along on the rails the crane could charge the batch bin from any of the stockpiles.

Cement was furnished by the Medusa Portland Cement Co. and West Penn Cement Co. It was shipped in bulk from the mills at Wampum and West Winfield, Pa. At the batch plant it was unloaded into a worm gear beneath the track which moved it along to the bottom of a 70-foot enclosed bucket elevator. This raised it to a silo built up on a steel platform. An outlet at the bottom of this silo permitted the loading of another silo which stood alongside at ground level. The plant had a storage capacity of 500 barrels.

From 7 to 16 Ford, Chevrolet, Dodge, and International trucks, holding 2 batches each, hauled the material to the respective bridge sites. There the concrete was mixed, dumped into buckets, and lifted to the forms by cranes. Tongue-and-groove 2-inch stock was made up into form panels, 8 feet deep, to pour lifts of that depth on the piers. The dry weights of a typical 7-bag batch used in the construction of the bridge piers was as follows:

Cement	658 lbs.
Sand	1,517 lbs.
¾-inch gravel	876 lbs.
1½-inch gravel	1,105 lbs.
3-inch gravel	1,204 lbs.
Water (total)	315 lbs.
Total batch weight	5,675 lbs.

Heavy Grading

All the major bridges were included in units 1, 2, and 4. When these were well under control the contractors began to push the grading operations. The new roadbed for the double tracks is from 30 to 40 feet wide, and in rock cuts a 10-foot berm was left on each side as a precaution against falling rock. The fill slopes are 1½ to 1 as are the earth cuts; in shale cuts the slopes are 1 to 1, while in solid rock they are 1 to 4. Both the old and new lines are approximately the same length and no radical changes in alignment or grade have been made. The sharpest curve is 5 degrees and 40 minutes, while the steepest grade is 0.3 per cent.



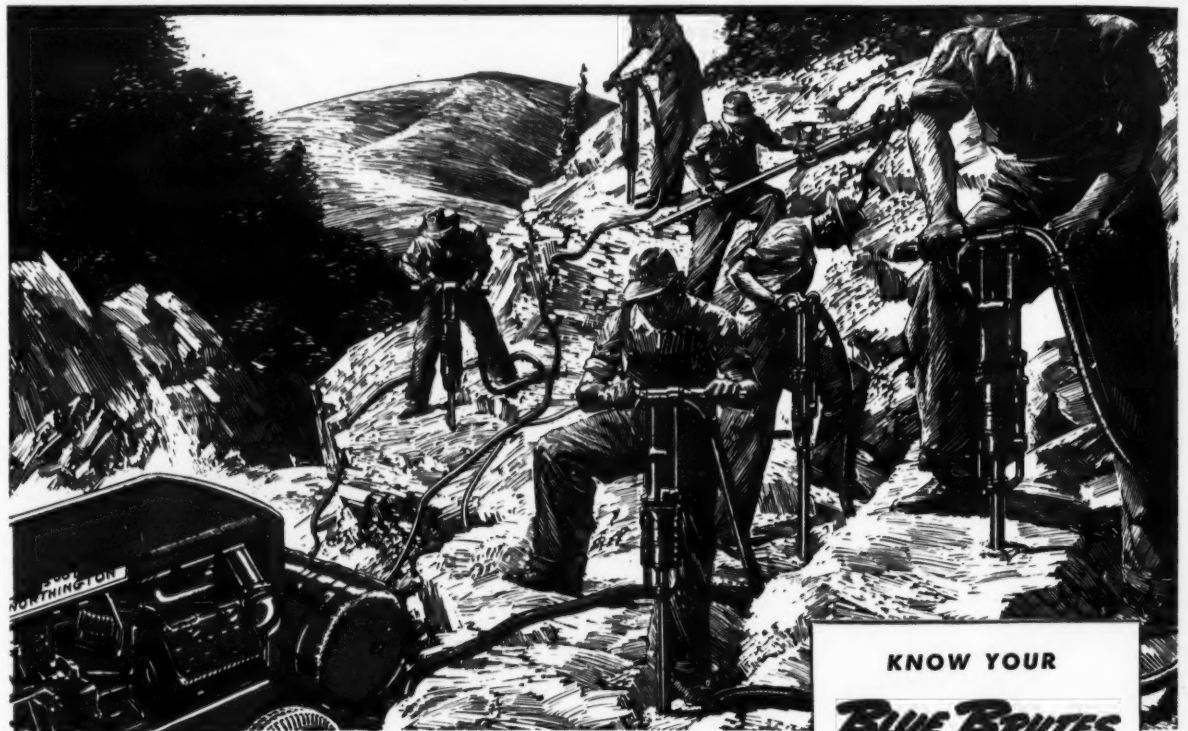
C. & E. M. Photo

At this Bow Ridge crossing of the Conemaugh River, the old and the new bridges actually intersect, the new passing over the old. Concrete substructures for six major bridges were included in the 16.1-mile railroad-relocation contract.

At Bow Ridge, a sharp, rugged piece of topography, an existing tunnel is being replaced by a large cut which has a maximum depth of 190 feet and stretches out for 2,000 feet. This small mountain is actually pierced by three tunnels: one for the original line of the railroad, another for a subsequent relocation and now in use, and the third to carry a canal. While this sizeable cut was being made, several slides occurred which added yardage to the total excavation. An adjoining fill, 125 feet high, has consumed much of the material from the cut. In this section the material has been mostly indurated clay crossed by horizontal strata of ledge rock which usually stands on a 1 to 1 slope.

The usual procedure in grading the rough terrain was to remove the overburden down to rock with a fleet of eight Wooldridge Terra-Cobras, self-propelled earth-movers carrying 10 pay yards each. They were assisted in loading by a push from a Caterpillar (Continued on next page)

THERE'S PROFIT-PACKED POWER IN EACH BITE



Every time a WJ55 Blue Brute Hand-Held Rock Drill bites into rock . . . it makes a big dent in operating costs, too.

That's because Blue Brute Rock Drills give close bidders the kind of performance that means quicker, cleaner, deeper drilling for longer periods with less punishment to the runner.

And this 55-pound rock eater needs no babying because it's tough-muscled at such key places as — its positive-acting, end-seating valve, its rugged chuck housing and its smooth-operat-

ing rifle-bar construction.

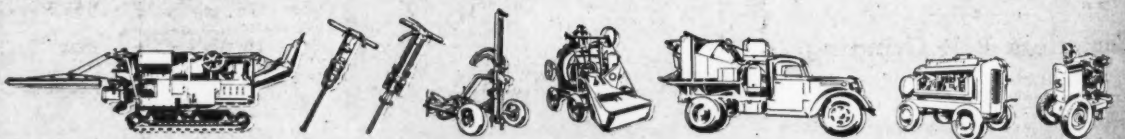
Furthermore, this top-notch performance is doubly sure when you team up WJ55's with a Worthington Blue Brute Compressor. This portable power-house gets its punch from light, tight, efficient Feather* Valves, rigid alignment through 3-point engine and compressor suspension, full force-feed lubrication and other features. Comes with Diesel or gasoline drive.

Write today for more detailed information on why *there's more worth in a Blue Brute.*

*Reg. U.S. Pat. Off.

K7-9

BUY BLUE BRUTES



IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

KNOW YOUR

BLUE BRUTES

Your Blue Brute Distributor will be glad to show you how Worthington-Ransome construction equipment will put your jobs on a profitable basis.

RANSOME EQUIPMENT

Pavers, Portable and Stationary Mixers, Truck Mixers, Pneumatic Placing and Grouting Equipment and Accessories.

WORTHINGTON EQUIPMENT

Gasoline and Diesel Driven Portable Compressors, Rock Drills, Air Tools, Self-Priming Centrifugal Pumps and Accessories.

WORTHINGTON



Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass.

STERLING PUMPS

STERLING

MACHINERY CORPORATION

405 Southwest Blvd., Kansas City

SIMPLE
DEPENDABLE
RUGGED
CHOICE OF
LEADING
CONTRACTORS
WRITE FOR
LITERATURE



C. & E. M. Photos

At left, three Wooldridge Terra-Cobras pick up 10 yards of pay dirt during grading for railroad relocation. A D8 assists. At right, in another cut, a Link-Belt Speeder 2 1/4-yard shovel loads a Euclid. Also shown are two I-R wagon drills powered by an I-R 500-cfm compressor, and two Kohler 5-kw light plants for night work.

D8 tractor-dozers. Another D8 and an Allis-Chalmers HD-14 tractor-dozers worked on the fills, spreading the dirt evenly in 6-inch layers. In addition to the compaction achieved with this heavy equipment, three sheepsfoot rollers were also available for use when necessary. In general, the material was sufficiently moist so that water-tank trucks were little used in the compaction. An 18 per cent moisture content was considered the optimum.

When rock was encountered, drill holes on an average of 6-foot centers were made with wagon drills, of which there were eight Ingersoll-Rand and one Cleveland on the job. Power was supplied by Davey, Chicago Pneumatic, Le Roi, and Ingersoll-Rand compressors, 315 and 500-cfm sizes, eight to ten in number during the progress of the work. A smaller I-R 105-cfm compressor furnished air for the Jackhammers employed in drilling the secondary blast holes. When the drilling continued into the evening, three Kohler 5-kw plants lighted the working area.

Only 6 and 12-foot lengths of steel were used in the wagon drills, and the 12-foot holes were charged on the average with 8 sticks of Atlas 40 per cent dynamite. After the blasts, the material in the cuts was excavated by two Link-Belt Speeder shovels equipped with Amsco 2 1/4-yard buckets. Rock, shale, and also a good bit of the dirt was hauled by a fleet of 15 Euclids, 9 end-dumps carrying 10 yards and 6 bottom-dumps carrying 13 yards. The rock was spread on the fills in 2-foot layers.

About 70 per cent of the total excavation was moved with the shovels and Euclids, while the remaining 30 per cent was handled by the Terra-Cobras and Le Tourneau RU and LP scrapers and Caterpillar D8's. With all types of equipment the hauls averaged 2,000 to 2,500 feet, and about 180,000 yards were moved during a month. Gulf Oil and RPM products were used by the contractor.

Tunnel Work

The single tunnel on the job is 2,660 feet long on a down grade of minus 0.3

per cent from east to west. It is included in the 1.5-mile contract of unit 3.

When completed, the concrete-lined structure carrying a double track will

be 30 feet wide within walls and about
(Continued on next page)

Here's the NEW MOIL POINT Designed to Cut Costs!

More and more contractors are discovering the new ROCKBIT detachable moil point will cut their job time and costs. This new moil point will stay sharp longer than ordinary moil points by more than 7 to 1. Furthermore, it will break up to 50% more concrete per man hour.

Such performance records are the result of a new principle in moil point design. The ROCKBIT detachable moil point is made in two parts: a shank of "tough" steel for long life, and a point of "hard" steel for cutting ability. When the point dulls it can be detached and a new point placed on the same shank. The old point can be reground by any laborer, eliminating old-fashioned blacksmith resharping.

Test the new ROCKBIT detachable moil point on your next job. Prove for yourself it will cut your job time and costs. If your distributor cannot supply you, write direct to our nearest plant.



Different kinds of steel in the shank and point give extra strength and durability.

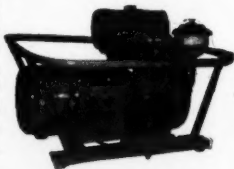
DEALERS ATTENTION: Immediate delivery from stock on all "ROCKBIT" Pneumatic Accessory Tools. Write for complete catalog and price list.

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Furnish the same kind of Current as the highlines. Sizes 500 watts to 100 KW. Also manufacturers of Rotary Converters, Frequency Changers, 32 and 110-volt D.C. motors in 1/4, 1/2, and 3/4-hp. A.C. motors (high line) in 1 1/2 and 2-hp. only.



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ROCKBIT
SALES AND SERVICE CO.

Railroad Relocated For Reservoir Project

(Continued from preceding page)

the same height, though with an arched roof. It bores through a hill near Saltsburg which has a top elevation of 1,250, or 338 feet above the center of the tunnel. The tunnel excavation totals 104,000 cubic yards, while the cuts at the west and east portals are about 170,000 and 190,000 yards respectively. Herman Holmes sublet the portal excavation to Ralph Myers of Salem, Ind.

Work on the tunnel started August 1, 1946, with the digging of a 15-foot-diameter pilot tunnel from the west end; it was completed to the east portal by December 14. This bore was carried about a foot higher than the floor elevation of the main tunnel section.

A 36-inch-gage track was laid in the pilot tunnel. On it rode a small jumbo carrying the drifter drills. Excavation was done with an electric-powered Conway mucking machine which loaded the material to 5-yard side-dump cars. Cars were maneuvered over switches and sidings within the tunnel, no cherry picker being used. Hauling equipment included ten cars and four electric locomotives—two General Electric and two Whitcomb. Batteries for the locomotives were charged on a G-E charger.

Full tunnel work started early in January, 1947, and is expected to be completed by the end of the year. A large steel jumbo was used in enlarging the pilot tunnel. It was built on a carriage with double-flange wheels riding on rails with a 24-foot gage. On the jumbo were mounted 8 Ingersoll-Rand DA-35 Model K1 3½-inch drifter drills.

Holes 10 feet deep on a horizontal plane were drilled, starting with 3-foot lengths of steel and increasing to 5, 7, 9, and 11-foot steel. Timken bits were employed ranging in size from 2¼-inch at the start and decreasing to 1¾-inch. On an average, 95 holes were drilled at the heading; these followed no set pattern except at the top where line drilling was required to get the shape of the arch. Du Pont 50 per cent dynamite was used in charging the holes, the amount varying usually between 275 and 300 pounds per shot. Firing was done with eight delays, the No. 1's being placed just over the roof of the pilot tunnel, and the others grouped

around the sides, bottom, and top.

At each charge about 300 yards of shaly silt stone and hard grey rock was unloosed; this averaged at least a yard of excavation to a pound of dynamite. An overbreak of about 10 per cent was common, the average width, rock to rock, being 36 feet and the height being around 35 feet. The roomy section within permitted a Bucyrus-Erie 1½-yard shovel to handle the mucking. It loaded to three end-dump Euclids which were turned on a template at 200-foot intervals and backed to the shovel in the tunnel. The material was dumped in a waste area about 2,000 feet from the west portal where it was leveled off by a couple of Allis-Chalmers tractor-dozers.

Steel Rib Supports

As the heading advanced, steel ribs weighing 3,600 pounds each when bolted together were erected through the tunnel at a maximum spacing of 4 feet. The ribs are made up of six pieces, a column on each side and four ring members arching overhead. The columns are 8-inch WF 27-pound sections, while the ring members are 8-inch WF 40-pound sections. Between the ribs are ¾-inch spacer bars on 6-foot centers, while the roof consists of 3 x 6 lagging, 8 feet long.

The steel was supplied by the Youngstown Steel Car Foundry Co. and the Commercial Shearing & Stamping Co. both of Youngstown, Ohio, and was delivered to the job in trucks. An Ingersoll-Rand air hoist hooked to the jumbo lifted the members in position so that they could be bolted together. The supporting ribs were usually kept up to within 8 feet of the face. Despite the precautions exercised, four men have been killed in the tunnel; they were crushed to death by falling rock.

Just outside the entrance to the west portal were the ventilating machinery and the air compressors. Compressed air for the drifter drills was furnished by one Ingersoll-Rand 315-cfm and two Le Roi 500-cfm compressors. They loaded into a 140-cubic-foot-capacity steel tank, 20 feet long x 3 feet in diameter. And from there a 6-inch air line ran down the side of the tunnel and up to the jumbo.

A 2-inch water line also served the heading, supplying water for the wet drilling and also to keep the muck well moistened and thus reduce the dust hazard. Water was pumped from a well to a small reservoir and thence to

the heading.

Ventilation was furnished through a 26-inch steel pipe hung along the side of the tunnel by wiring it to tie rods in the ribs. An Ingersoll-Rand 28-inch blower, turning at 3,540 rpm and driven by a G-E electric motor, drove air through the pipe at the rate of 12,000 cfm. This unit could either blow air or act as an exhaust fan. So the heading could be fully ventilated at all times in the most efficient manner.

On the opposite side of the tunnel from these utilities were the electric lines with current furnished by the

West Penn Power Co. The blasting line was on a 220-volt circuit, while another 220-volt line supplied light. Bulbs of 100 watts were strung along the tunnel at 50-foot intervals.

Two 10-hour shifts have been employed in the tunnel: from 7 a.m. to 5 p.m., and then from 7 p.m. to 5 a.m. the following morning. There has also been a call shift consisting of six men. During each 24 hours two blasts were set off; the rest of the time was given over to mucking, drilling, and setting the steel supports.

(Concluded on next page)

You can quickly and profitably trowel a smooth, resilient, long-lived surfacing right over that old concrete or wood floor.



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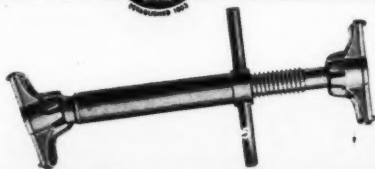
crack, crumble, curl or loosen. Also patches concrete to a perfect feather edge. Heavy loads on steel wheels actually improve it. Five-year-old floors show no wear. Used by largest railroads and industries in America. Over 600 contractors have found Plastic Rock a good-will builder and profit source. No special equipment needed. Not for home use.

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STRONGER

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Williams Type
BUCKETS

Stronger because they're constructed of **welded rolled steel**... lighter because non-essential weight has been eliminated. Wellman buckets meet every requirement of heavy service with longer life and lower cost! A type for every service: Multiple Rope, Power Arm, Dragline, Power Wheel, Special Service. ¾ to 16½ yd. capacity.

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THE WELLMAN ENGINEERING COMPANY
7012 CENTRAL AVENUE • CLEVELAND 4, OHIO



C. & E. M. Photo

For concrete bridge piers on the \$7,000,000 railroad-relocation job, this Noble batch was set up on a Pennsylvania RR siding near the center of the project. The Browning 25-ton whirley steam crane at right unloaded and stockpiled aggregate.

A typical day crew in the tunnel consisted of the following:

Superintendent	Tractor-dozzer operator
Tunnel foreman	Carpenter
Mucking foreman	Drillers—8
Electrician	Drillers' helpers—8
Compressor operator	Shovel operator
Euclid drivers—3	Shovel oiler
Laborers—6	

The night crew was fewer in number since no carpenters or electricians were required.

When the excavating was finished, the floor of the tunnel was paved with a concrete invert 18 inches thick; this will carry the ballast for the double track. Tunnel lining consists of 2-foot concrete walls which encase the steel ribs and go at least 6 inches beyond them to the limits of the rock. A concrete batch plant was set up at the job site and batches were hauled to a Rex 27-E paver set up inside the west portal. The concrete was pumped to the lining forms by a Rex Pumpcrete machine.

New Concrete Dam

When completed, Conemaugh Reservoir will be the ninth in a chain of reservoirs in the tri-state area of western Pennsylvania, eastern Ohio, and West Virginia. The chain is designed to reduce flood dangers by cutting 10 feet off future high water along the Allegheny and Ohio Rivers. A disastrous 46-foot flood hit Pittsburgh in March, 1936, and caused an estimated \$200,000,000 damage in that city alone. Other floods have occurred since, the highest being in 1942 when the waters rose to 11.6 feet above flood stage. When the Conemaugh Dam is completed, the flood menace should be removed from Pittsburgh and the Ohio Valley communities.

Scheduled to get under way in 1948, the new dam will be a concrete gravity-type structure 1,090 feet long; it will have a maximum height of 170 feet above foundation. On the right bank of the river an earth embankment section 200 feet long will provide an access road to the dam. It will be located about 2 miles from Tunnelton and 7½ miles above the confluence of Loyalhanna Creek with the Conemaugh River.

Outlet works in the dam will include 13 sluices, 5 feet 8 inches x 10 feet, one of which will normally remain open to pass the minimum natural stream flow. They will all be controlled by hydraulically operated sluice gates. Spillway discharge will be controlled by 14 direct-lift crest gates, 30 feet long x 27 feet high, which will be operated by two gantry cranes.

At spillway-crest elevation Conemaugh Reservoir will have a gross storage capacity of 274,000 acre-feet. This is the equivalent of a 3.8-inch runoff from the total drainage area of 1,351 square miles above the dam. A minimum pool about 33 feet deep will be maintained at the dam at all times. The pool will contain about 4,000 acre-feet of storage over an area of 300 acres. The total cost of the entire project will be around \$33,000,000. By 1950 the new

dam should begin impounding water into the big reservoir.

Quantities and Personnel

The totals of the major items included in contracts 1, 2, and 4 are as follows:

Clearing and grubbing	398 acres
Unclassified excavation	2,725,700 cu. yds.
Borrow	556,500 cu. yds.
Common excavation, bridges	62,850 cu. yds.
Rock excavation, bridges	17,000 cu. yds.
Cast-iron pipe, 24-inch	2,140 lin. ft.
Reinforced-concrete pipe, 18-54-inch	2,853 lin. ft.
Corrugated, perforated-metal pipe, 8-inch	12,160 lin. ft.
Concrete, bridges and structures	38,200 cu. yds.
Steel reinforcement	2,267,000 lbs.

On these three contracts the Hunkin-Conkey Construction Co. and Shofner, Gordon & Hinman were represented by V. E. Robertson as General Manager.

The major items in the Herman Holmes contract 3 which includes the tunnel are:

Unclassified excavation	361,600 cu. yds.
Rock excavation, structures	11,200 cu. yds.
Tunnel excavation	104,000 cu. yds.
Steel tunnel supports	1,630,000 lbs.
Concrete in structures	4,360 cu. yds.
Concrete in tunnel invert	7,600 cu. yds.
Concrete in tunnel lining	20,150 cu. yds.
Steel reinforcement	810,000 lbs.
Reinforced-concrete pipe, 18-54-inch	1,054 lin. ft.

William Trestrail is Superintendent on the tunnel project. From 600 to

1,000 men have been employed on both contracts.

For the Corps of Engineers, Donald D. Rait is Resident Engineer on the entire project. The work is being done under the direction of the Pittsburgh District Office of which Col. Walter E. Lorence is District Engineer. Wilfred Bauknight is Acting Chief, Construction Division.

Crowding-Swiveling Loader

A broadside covering its C-S loader is being distributed by the Conant Machine & Steel Co., West Concord, Mass. It shows a photograph of the 1947 crowding-swiveling loader, and points out in text its salient features. It tells of the sizes in which the unit is made, of the screen frame for separating fines and stones, of the return chute for bringing spill back to the bottom of the bucket line, and many other features.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 77.



In Dense Concrete...

**there's
nothing faster
-nothing better**

Designed for really heavy work, no other demolition tool in the 80-pound class can outperform the CP-117. It is particularly recommended for the speedy demolition of dense concrete and other extremely hard materials. Valve-actuated, it strikes a very heavy blow — yet is easy to hold, having no kickback, and it does not require "riding." Furnished with either spring or latch type retainer.

Accessories that may be used with this tool include spade, digging tool, asphalt cutting chisel, peg point, narrow chisel, and tamper with shank. Write for further information.



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The new Buda Model HBJ earth drill is hydraulically controlled. It drills 6 to 42-inch-diameter holes to depths of 10 feet. And it is engineered for minimum set-up time.

Earth-Boring Drill Digs 42-Inch Holes

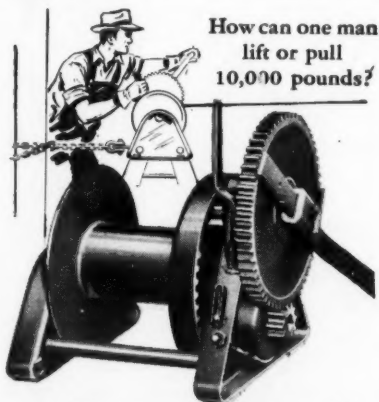
A hydraulically controlled earth drill for boring holes from 6 to 42 inches in diameter and 10 feet deep is made by the Buda Co., Harvey, Ill. The manufacturer recommends that it be mounted on a flat-bed truck or a heavy 4-wheel trailer. It can be quickly attached or removed.

The Model HBJ earth drill is said to be engineered for convenient transportation and minimum set-up time. The tower is moved into operating position by hydraulic power. Fingertip controls permit adjustment of the drill head to a vertical position. All leveling adjustments for either straight or anchor holes are completely hydraulic. The drill is powered by a 4-cylinder Buda gasoline engine. The engine, together with the drilling mechanism, is mounted on an I-beam of structural steel; this results in a packaged unit.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 15.

N. Y. Distributor for B-G

The Hooper Engineering Co. of Skaneateles, N. Y., has been appointed exclusive distributor for the Barber-Greene Co. in central New York State. Hooper will represent the Barber-Greene Construction and Industrial Divisions whose products include bituminous mixing and paving machines, portable bulk-material loaders, ditchers, portable and permanent belt conveyors, and crushers.



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10,000 pounds?

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One man, working alone, can lift a truckload of cement... or drag a 5-ton machine... or lower a steel I-beam into place... with the American Hoist HANDIWINCH. Weighs only 95 lbs.; can be carried and set up anywhere. Ruggedly built, has cut steel gears. On the market only one year—thousands already in service. Sells for \$75 f.o.b. your distributor's warehouse.

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and DERRICK COMPANY

Saint Paul 1, Minnesota

Information on Welding Of Manganese-Steel Parts

A booklet on the welding of 11 to 14 per cent manganese steels has been prepared by the Stulz-Sickles Co., 134-142 Lafayette St., Newark 5, N. J. In the Manganal electrodes, nickel has been added to prevent the liberation of carbon in the form of carbides during the welding operation. This means, according to the booklet, that the parent metal and the deposited metal from the electric arc are always in the austenitic state, which gives the metal its tough characteristics.

The catalog discusses the Seaco hard-facing welding electrodes, describes the welding procedure when welding with Manganal, and shows some typical applications for its use. The process is recommended by the manufacturer for repairing and reclaiming bucket and shovel teeth, crusher plates, tractor grouser cleats, gyratory-crusher mantles, roll crushers, and other construction and in-

dustrial applications.

This 18-page bulletin shows the various sizes and shapes in which the Manganal filler and wedge bars are made. It contains a series of questions and answers on the history of manganese steel, and another series on the use of Manganal rods.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 56.

Plans for Concrete Plants

Information on the design and planning of concrete plants has been assembled in booklet form by the C. S. Johnson Co., R. F. D. No. 1, Champaign, Ill. This 36-page book contains 60 photographs, 30 illustrations, and concise text matter on laying out stationary and mobile plants.

Operating techniques are thoroughly explained, and detailed information is given on overhead bins, weigh-batching equipment, and cement and aggregate handling and storage. The book-

let outlines a definite procedure to be followed for starting central-mix, ready-mix, or concrete-products plants. Blueprint-type sketches are used to explain in detail the types and disposition of the equipment involved in different installations. Sequence of operation for most efficient output is given for each type of plant. In addition, all auxiliary Johnson equipment is illustrated and described.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 70.

Syntron Montreal Office

The opening of a branch sales office in Montreal, Canada, has been announced by the Syntron Co. Located at 4695 Sherbrooke St., West, it will be under the direction of C. F. A. Gray. Sales and engineering service will be available on the Syntron line of vibratory material-handling, and construction and maintenance equipment.



We've "short-cut" our short hauls!

Those short hauls on a dirt-moving or fill job used to be a real headache for us. But not any more since our Oliver "Cletrac" dealer showed us how we could "short cut" them.

We were talking the situation over one day when he came up with this. "Look," he said, "on those short hauls you can save a lot of time by equipping your Cletracs with Drott Bull Clam Shovels. You see, these units can act as a bulldozer and scraper combined... at a lot lower operating cost and in a lot less time. They scrape up the dirt, carry it in the bowl direct to the dumping point. They travel straight ahead with no time out to change position for loading or unloading. There's no loss of material en route and the unit levels the surface ahead of the tractor when it loads and when it's traveling. The operator can regulate the depth of cut from his seat. This unit doesn't dig a hole to fill a hole. The blade can be tilted horizontally to either side to get a straight cut, even on uneven ground."

Let me tell you they really short-cut our short hauls. The Oliver "Cletrac" dealer sure is a big help to us. He's a good man to know!

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Industrial Division: 19300 Euclid Avenue, Cleveland 17, Ohio

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Convention Calendar

Jan. 21-24, 1948—ASCE Meeting

Annual meeting, American Society of Civil Engineers, Hotel Commodore, New York City. Col. William N. Carey, Executive Secretary, 33 W. 39th St., New York 18, N. Y.

Jan. 26-28, 1948—ARBA Conference

Conference, American Road Builders' Association, Willard, Mayflower, and Statler Hotels, Washington, D. C. Charles M. Upham, Engineer-Director, International Bldg., Washington 4, D. C.

Feb. 2-5, 1948—Purdue Road School

Annual program, Memorial Union Bldg., Purdue University, Lafayette, Ind. Ben H. Petty, Professor of Highway Engineering, School of Civil Engineering and Engineering Mechanics, Purdue University.

Feb. 9-12, 1948—AGC Convention

Annual convention, Associated General Contractors of America, Baker and Adolphus Hotels, Dallas, Texas. H. E. Foreman, Managing Director, Munsey Bldg., Washington 4, D. C.

Feb. 11-12, 1948—Roadside Development

Seventh Annual Short Course on Roadside Development, Auditorium of Ohio Departments of State Bldg., 65 So. Front St., Columbus. Dallas D. Dupre, Jr., Landscape Architect, Department of Highways, Columbus 15, Ohio.

Feb. 15-19, 1948—AED Convention

Annual meeting, Associated Equipment Distributors, Edgewater Beach Hotel, Chicago, Ill. Frank G. Knight, Executive Secretary, 360 No. Michigan Ave., Chicago 1, Ill.

July 16-24, 1948—ARBA Road Show

Road Show, American Road Builders' Association, Soldier Field, Chicago, Ill. Charles M. Upham, Engineer-Director, International Bldg., Washington 4, D. C.

ARBA 1948 Nominees

In accordance with the provisions of its constitution, the Nominating Committee of the American Road Builders' Association has made public its list of official nominees for 1948 officers, and for directors to serve a three-year period. The nominee for President is J. T. Callaway, Assistant to the Vice President of Goodyear Tire & Rubber Co.

For Vice Presidents: Paul B. Reinhold, President, Atlas Equipment Co., Pittsburgh, Pa.; Charles W. Smith, President, Smith Engineering & Construction Co., Pensacola, Fla.; W. A. Roberts, Vice President, Allis-Chalmers Mfg. Co., Milwaukee, Wis.; and T. E. Stanton, Materials and Research Engineer, California Department of Public Works, Sacramento, Calif. H. C. Whitehurst, candidate for Treasurer, is Director of Highways, District of Columbia, Washington, D. C.

Nominees for Directors to serve terms ending in 1951 are: Edgar J. Buttenheim, Publisher, CONTRACTORS AND ENGINEERS MONTHLY, New York, N. Y.; T. H. Cutler, Chief Engineer, Kentucky Department of Highways, Frankfort, Ky.; Edward S. Gillette, Publisher, Roads and Streets, Chicago, Ill.; Otto S. Hess, Engineer-Manager, Kent County Road Commission, Grand Rapids, Mich.; Howard R. Meeker, President, J. D. Adams Co., Indianapolis, Ind.; Charles M. Noble, State Highway Engineer of New Jersey, Trenton, N. J.; and Murray D. Shaffer, Director of Highways of Ohio, Columbus, Ohio.

Bulletin Describes Jacks

A descriptive bulletin on its line of Simplex lever, screw, and hydraulic jacks has been issued by Templeton, Kenly & Co., 1006 So. Central Ave., Chicago 44, Ill. It features specification charts showing complete details for all the jacks in the line, as well as certain specialties such as the Simplex-Jenny center-hole hydraulic pullers, the Util-A-Tool, drop-forged steel trench braces, and timber braces.

In addition to the specifications, sev-

eral distinct features of the Simplex jacks are outlined. The front page of Industrial Bulletin No. 48 tells about the Simplex industrial hydraulic jacks, mentioning the recently added 100-ton model. The center spread of the bulletin describes in detail the new single-acting Simplex ratchet lowering jacks.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 81.

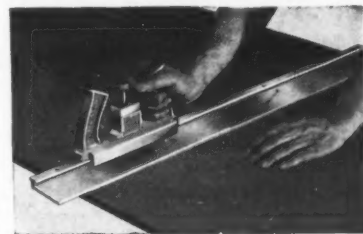
Wide Belt Cutter

A new belt cutter for use with belts up to 60 inches wide and 1½ inches thick has been announced by the Flexible Steel Lacing Co., 4656 Lexington St., Chicago 44, Ill. It consists of two

parts: a head which holds the blade and a T-shaped base or guide rail. It is known as the No. 300 Alligator wide-belt cutter.

When the cutter is to be used, the base is first squared with the center line of the belt. When properly aligned, it is nailed to the belt in order to keep it from slipping. The blade is then pushed through the belt to make a cut of about ⅛ inch. By means of an adjusting screw, the blade is then lowered another ⅛ inch, and the process repeated until the belt is completely cut.

The base is made in four lengths for 24, 36, 48, and 60-inch belts. Each base is four inches longer than the width of belt on which it is designed to operate, to give sufficient guide to the head when

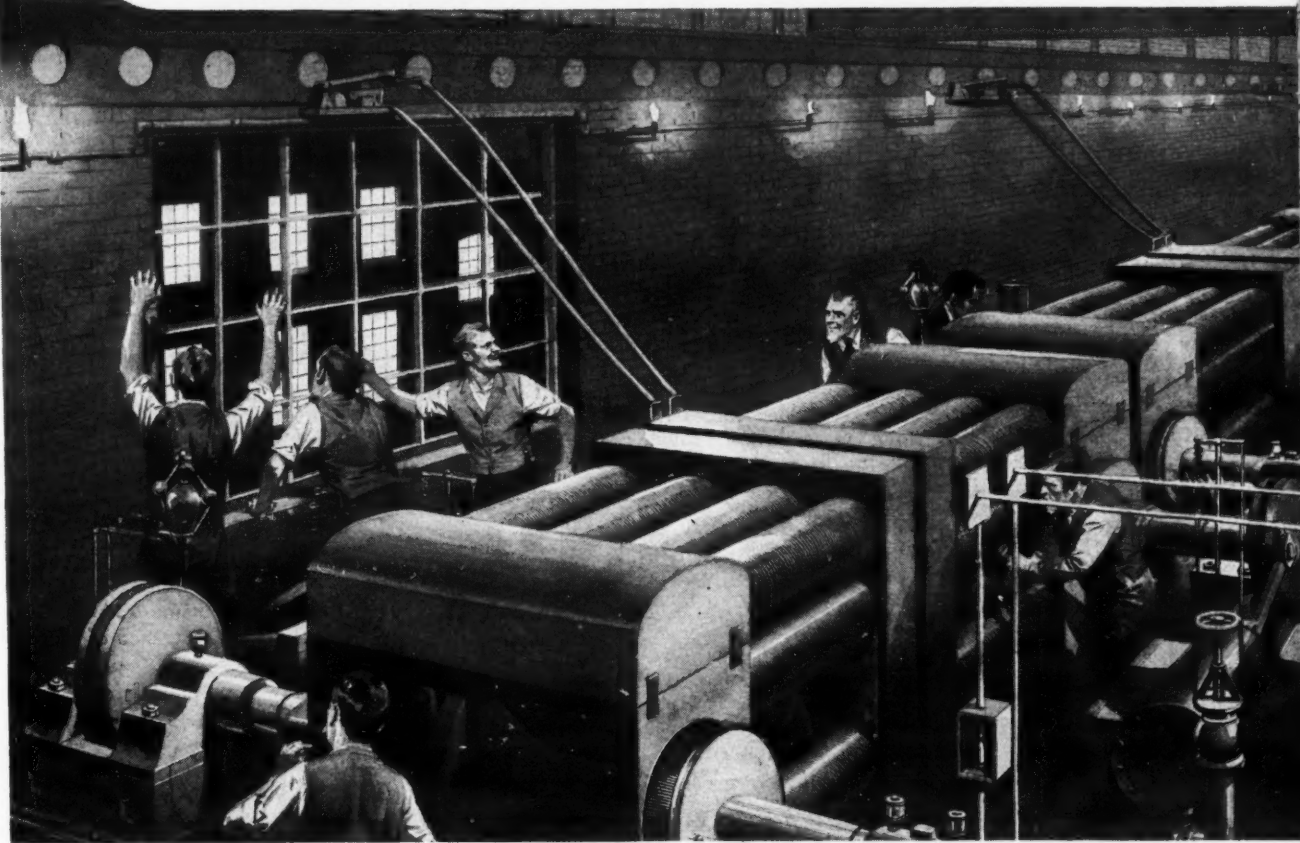


Here the No. 300 Alligator cuts a belt.

the blade is drawn across and clears the outer edge of the belt. The blade is made of steel sharpened into a V-shape.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 7.

CONFIDENCE...how much is it worth?



IN 1880, when electric lights first were tried on New York's Broadway, Roebing's confidence in the future of electricity motivated a new Roebing undertaking . . . the manufacture of electrical wire and cable.

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Your confidence in Roebing is valued by every Roebing employee. His income depends upon his ability to preserve that confidence. Every Roebing employee knows that you will continue to prefer the output of his hands only if he produces better products and gives you better service. Your confidence in Roebing is Roebing's best salesman.

This applies, not only to electrical wire and cable, but to all Roebing products.

WIRE ROPE . . . ONE OF THE FIRST

Wire rope, the first product manufactured by Roebing, plays an important part in every industry. Its economical use depends upon its proper application, and hundreds of men in your industry have found a cooperative and helpful friend to lend a hand when they were puzzled with wire rope problems. He is their Roebing Field Man.

They find that he really knows wire rope and its applications, yet never hesitates to call on the Roebing Engineers and the Roebing Development and Testing Laboratory.

We, here in Trenton, are constantly being reminded by grateful customers of the ability and integrity of their Roebing Field Man . . . of his honest and successful efforts to prove that the words "Confidence" and "Roebing" are one and the same.

At the right is a listing through which your nearest Roebing Field Man can be contacted. Why not call or write him today? Make an appointment to meet a friend who can save you both time and money on your wire rope installations.

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Portland, Ore. 1032 N. W. 14th Avenue . . . Broadway 5456
San Francisco 1740 17th Street . . . Market 8787
Seattle 900 First Avenue, South . . . Main 4992

ROEBLING

A CENTURY OF CONFIDENCE



Bridge Battered by Floods; Crews Remain to Whip Jinx

**"Hexed" Bridge Is Dubbed
"Unluckiest of 1947" as
Floods Rip Underpinning
To Shreds Three Times**

† ON the afternoon of June 12, 1947, two men—one a contractor's bridge superintendent and the other a state highway commission engineer—stood on a high knoll overlooking Timber Creek just a few miles southeast of Marshalltown, Iowa. All morning the radio had electrified the nation with graphic descriptions of floodwaters which inundated much of the state.

These men, J. P. Kusian of the Iowa Falls firm of Welden Brothers, and Glen Snyder of the Iowa State Highway Commission field staff, needed no radio. Here in the swirling brown muddy waters of Timber Creek they watched the handiwork of weeks ripped to pieces.

Logs, trees, and brown water hissed downstream. Now and then a big chunk would strike the swirl above what had been a steel pile cofferdam encircling the footing of a pier. On the opposite shore a farmer who lived near-by walked down to the water's edge. Gazing apprehensively at the high-water mark within inches of the new concrete roadway, he yelled, "I've lived here fifty years, fellers, and this is the worst it's ever been by 10 feet!"

Kusian Knows It's Bad

Kusian nodded ruefully. John Q.

Farmer was saying nothing that was news to him.

On May 12, just a month before, the Iowa State Highway Commission had issued a work order starting Welden Brothers on the construction of a new 180-foot continuous, concrete-girder structure, 26 feet wide curb to curb. Previous attempts to get a bid on this bridge had not been fruitful. Now, at a low bid price of \$49,721.14, the contractor's crew was trying desperately to get something done.

The job seemed possessed with voodoo. Kusian came in with the start order, bringing a Northwest crane and a 3/4-yard clamshell bucket. He had the west abutment dug out. Scouring the country for form carpenters, he scared up enough men to build the first set of abutment forms. It began to rain.

When the first storm was over, tons of dirt had caved in around the abutment forms, crushing many of the boards and timbers.

Doggedly Kusian and his crew went back to work. They cleaned the dirt out with the clamshell bucket. Carpenters rebuilt the forms. The day they were finally checked and made ready to pour, another deluge hit the job and eroded whole chunks of earth. Again the forms were crushed.

As the men worked to clean out the forms for a second time, it seemed that the rains must certainly be over. But flood forces had worked to make the job much tougher. Where Kusian once



C. & E. M. Photo
Swinging a 1-yard clamshell, this Northwest crane takes mud out of the cofferdam on the Timber Creek job.

waded across the stream in hip boots, now it was 35 feet wide and over his

head for depth. A huge gravel bar just below the bridge had risen, to divert the stream dangerously. Kusian put it back where it belonged with a single monstrous blast of ditching dynamite.

Now the Northwest crane jumped in to work. Steel sheeting was driven down in place around the first pier on the west bank of Timber Creek. Hanging leads and a heavy drop hammer slammed the AP sections in to 20 feet of penetration. Altogether 76 pieces went into that cofferdam, creating a tight rectangular bulkhead about 45 x 12 feet. The clamshell had just started to dig the mud out of the cofferdam when the skies grew dark again.

It was the night of June 11.

By the morning of the 12th the first menacing patter of raindrops changed to a sullen drumming beat. Timber Creek leaped up bank-full. In a matter of hours it changed from a docile stream to a wild beast, raging at confinement, clawing at the steel cofferdam. As Kusian and Snyder stood there in

(Continued on next page)

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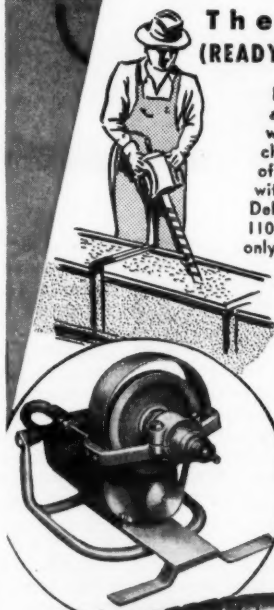
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Left: The FS-7A with reduction attachment to provide the most desirable shaft speed for wet or dry rubbing or grinding of concrete.



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ROCKFORD CLUTCH DIVISION

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C. & E. M. Photos

Walden Brothers' "hexed" bridge finally did reach the stage of deck pours. In this first photo, form work is in progress and reinforcing steel in place. The center photo shows an intricate layout typical on a bridge, as carpenters fit a lumber form in place between the steel. At the right, carpenters make a cut of a long board on a Wisconsin-driven table saw on the Timber Creek bridge job near Marshalltown, Iowa.

the rain that fateful moment, the swirl above the cofferdam gave way, moved downstream a few feet.

"God!" Kusian exclaimed. "It's undercut the cofferdam!"

Impossible as they seemed at the moment, the worst fears of these men proved true when the floodwaters went down.

For the third time the abutment forms were mashed and silted in. Timber Creek had eaten a great hole out from underneath the steel piles. Now they lay over at a crazy angle, almost on their sides. Somewhere down in the mud lay the pile hammer, a follow block, a water pump, and the clamshell bucket. Steel corduroy rails, on which the crane had worked from an extra pile bent, lay scattered through the debris.

Cleaning Up the Mess

Well, it seemed the jinx was holding. This time the rain had run off a few of his men, too. With what remained, Kusian set to work again to rebuild. Vivid in his mind were thoughts of all the work that had gone in before, all to be washed away; memories of several days at a time building roads for the Northwest machine, only to have to move it out hurriedly ahead of the rain.

Kusian brought the Northwest machine back in. With the cofferdam over on its side, he had to right it somehow before an extractor could pull the piles. But the cofferdam weighed more than 30 tons and was sanded in. How could he get it loose with the small crane?

He drove wood piles around the cofferdam above where he proposed to make some Herculean lifts. He rigged 5-way blocks between a cap on these piles down to the cofferdam piling. He brought in a 2-drum gasoline hoist and lashed it tight to the base of an oak tree so a hard pull wouldn't slide the machine. He ran a 3/4-inch preformed-wire-rope line out from the drag drum of the Northwest, and made two 5-way pulls ready.

Standing high above the mess where he could see, he gave the signals to take a strain.

With a crack like a pistol shot the first line parted, yanked in two by the terrific force of gears exerting a pull greater than the tensile strength of the line. But a moment before it let go, Kusian noticed that a corner of the cofferdam budged!

Returning to the task, he re-rigged, made other pulls. With a strain here and a lift there, the two machines broke the cofferdam loose from the sand. Other cables parted, too, but they failed to fly dangerously because of the inert characteristics of strands in preformed rope—the same characteristics which make it last longer on all ordinary operations. No 3/4-inch cable could have taken this brutal kind of punishment.

By and by they managed to right the 30-ton cofferdam. They tied it off to the upright wood piles, with pieces of broken cable strewn around after the battle. Once the cofferdam was righted, the piles extracted quite easily. That

was one of the few easy things about the job.

Re-Drive Cofferdam

The steel piles were then re-driven, but here another dismaying problem raised its head. The piles were now

not long enough to penetrate as far as they should. Kusian was unable to get any longer ones. He drove these as far as possible, clammed out a hole to the proper depth after bracing the cofferdam thoroughly, and drove his bearing piles in the bottom. Specifications called

for 20 H-beam bearing piles in the west pier, 8 in each abutment, and none in the east pier which went down to bed-rock.

The 36 and 48-foot piles in abutments and the 18-foot H-beams in the pier

(Continued on next page)



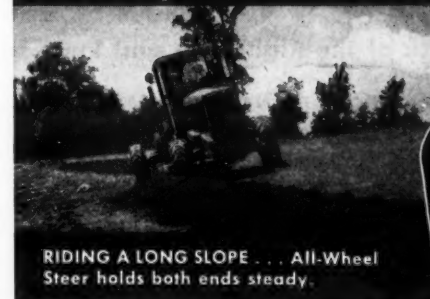
FINISHING A SLOPE... without leaving tire marks



BUILDING A ROAD... moving a tremendous windrow.



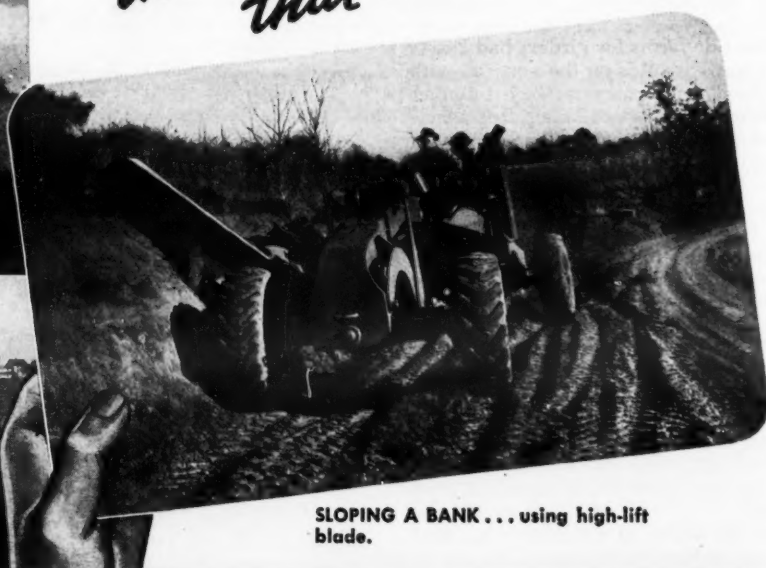
MIXING BLACKTOP... all wheels miss the windrow.



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C. & E. M. Photo

After being flooded out three times, the worst was over for these two when their pictures were taken — J. P. Kusian, left, Bridge Superintendent for Welden Brothers, and Glen Snyder, right, Resident Engineer on the job.

Bridge Hit by Flood; Crews Whip the Jinx

(Continued from preceding page)

were driven down to 36 tons of bearing per pile. After they were in place Kusian poured 50 cubic yards of concrete in the bottom of the cofferdam to seal the piling and mud.

At the same time—perhaps sooner by a few days—he got that troublesome west abutment in.

Came then one of the hottest, driest summers in Iowa's history. Temperatures stood near 100 for days. Kusian's crew sweltered, but it made hay. By the time *CONTRACTORS AND ENGINEERS MONTHLY*'s Western Editor was able to visit the project in mid-September, the crew had finally finished the first pier and was well established as to methods to be used through the remainder of the job.

Forming Methods

Form carpenters are scarce in this section of Iowa, and Kusian was hard-pressed to keep a crew together. Much of the 3-pile-bent falsework, placed on 12 to 15-foot centers with four 3 x 12-inch laminated-timber caps, was used to carry the forms and concrete in the continuous-girder deck pours when they were made.

Deck bottom forms rested on 2 x 6-inch cross members, and all unexposed surfaces were formed with 1 x 12 S4S pine boards. All underpinning consisted of 12 x 12's, usually made up by laminating 3 x 12's and then shimming or wedging from underneath to level the deck. The 2 x 6's were on 24-inch centers.

The side forms for girders had 2 x 4-inch upright studs on the vertical, with plywood or masonite-faced lumber forming the exposed concrete surface. Steel tie rods $\frac{3}{4}$ inch in diameter, with adjustable wing nuts on the outside of twin 2 x 6 wales, were set on 4-foot centers. A strain on these tie rods held the forms in line. Spreader boards the thickness of the beams, inserted between the forms, held the forms the other way until the concrete was placed and they could be removed. As Kusian builds forms, they cannot move either way under ordinary conditions. Rain and floods are something else.

Concrete-Placing Methods

With 620 cubic yards of concrete to pour around some 88,721 pounds of steel reinforcement and caps, this part of the work amounted to a sizable sum. Just as soon as the first abutment was ready, Kusian's crew poured it, using a little Kwik-Mix Dandie 16-S concrete mixer. Concrete aggregates and sand were hauled out from a building-supply firm in Marshalltown, and Penn-Dixie portland cement in bags was used.

The mixer was spotted near the pours, materials were wheeled in, and

these were handled fairly easily.

The shortage of skilled help, however, influenced the use of a faster, more economical method of concrete placing for the other pier, abutment, and deck pours. At the time this magazine was represented on the job the 16-S mixer was set up on a timber platform directly over a Rex Pumpcrete machine. About 200 feet of 6½-inch ID steel pipe was available, with elbows and connections, to route mixed concrete rapidly and economically to any part of the bridge.

Job Seems Out of Danger

With the cofferdam driven around the east pier, and excavation proceeding rapidly towards bedrock, Kusian seemed to be out of danger. He expected to have the last of the concrete poured, clean-up finished, and the job done by November 25.

But as black thunder clouds gathered in the Iowa skies near Marshalltown to herald the approach of autumn, Kusian found himself looking them

(Concluded on next page)



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over skeptically. He had been drowned out three times by floods already this year and could believe almost anything possible in the future.

Personnel

The Timber Creek Bridge was designed and the contract administered under the direction of Fred R. White, Chief Engineer of the Iowa State Highway Commission. W. E. Jones is Design Engineer and A. A. Baustian is the Construction Engineer.

But it was Kusian who worried about the bridge.

Truck-Cab Heaters Winter Safety Aid

One of the prime requisites of winter comfort and safety for operators of trucks and other mobile equipment is a warm cab in which the windshield is kept clear of sleet and fog. Heaters built specifically for this purpose are made by the Thermo-Aire Division of the Evans Products Co., 15310 Fullerton, Detroit 27, Mich. They are made in two models, the AD-10 and the AD-10A. Details of both are identical except for the location of outlets.

These heaters are said to have a motor-fan combination engineered especially to operate under the high pressure necessary to do the proper heating and defrosting job. The heater package contains water hose, hose clamps, shut-off valve, engine fittings, 2-speed switch, defroster hose, defroster nozzles, and all necessary bolts, nuts, and lead wires. Universal defroster nozzles have been supplied for trucks having no built-in defroster attachments. If defroster nozzles are already installed, the heater may be connected to them, according to the manufacturer.

The heater has a steel case with a baked dark-brown wrinkle finish. The core has heavy-gage brass tanks, headers, and tubes, and copper fins. The motor is of the heavy-duty bus type.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 11.

Folders Describe Belting

Two new folders on its Maltese Cross line of rubber conveyor and elevator belting are available from the Hewitt Rubber Division, Hewitt-Robins Inc., 245 Kensington Ave., Buffalo 5, N. Y.

The folder on the conveyor belting stresses the job-engineered features claimed for it by the manufacturer, which are said to result in extra strength, greater flexibility, and longer service life. It describes the belting's construction of Hewitt-developed rubber compounds with selected staple cotton reinforcements.

The folder on the elevator belting stresses its tonnage records for low-cost materials handling. It explains why the belting will stand up under various operations, how it is made, and what it is designed to do. It also points out specific features such as resistance to abrasion and mildew.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 26.

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Welding-Award Winners

The winners of its 1946-47 Design-for-Progress Program have been announced by The James F. Lincoln Arc Welding Foundation. The purpose of this program is to further arc-welded design, research, and education. The awards are selected from papers submitted in fifteen scientific and engineering classifications.

A main award of \$10,700 was presented to Kiser E. Dumbauld, Design Engineer, Bureau of Bridges, Ohio Department of Highways, for his paper on the re-design to welded construction of three of Ohio's bridges. Another main award of \$8,200 went to G. J. Storatz, Engineer in Charge, the Heil Co., for his paper on the welded construction of the Heil Trailbuilder, a heavy-duty bulldozer for clearing wooded areas, dirt-moving, etc.

An award of \$1,250 went to G. W. Smith and C. H. Darby, Associate Bridge Engineers, Division of Highways, Department of Public Works, State of California, for a paper on the design and construction of three proposed types of highway bridges: steel beams with concrete deck, prefabricated concrete, and prefabricated welded steel. Michael F. Petrofesi, Assistant Civil Engineer (Structural), Office of the President of the Borough of Manhattan, won \$950 for his paper on the design of a proposed highway overpass.

An award of \$500 was given to Henry A. Oldenkamp, Development Engineer, Warner & Swasey Co., Cleveland, Ohio, for his paper on the re-design and fabrication of a number of parts on the Gradall excavating machine. Arthur Hill, Plant Engineer, Lewis Mfg. Co., San Antonio, won \$250 for his paper on the re-design of a small maintenance-type tandem roller.

Booklet on Chain Fittings

Thirty-two pages of information on fittings for wire rope and chains have been assembled in catalog form by The Thomas Laughlin Co., 133 Fore St., Portland, Maine. Products described in Catalog No. 140 include such items as clevis hooks, replacement swivel safety hooks, improved safety hoist hooks, Burton hooks, elevator socket bolts, weldless sling links, straight-hole eyebolts, and others.

This data book presents detailed working characteristics of each product. Tables have been included to eliminate guesswork in selecting the proper fitting for each job; they help make the booklet a handy reference source for users of these products. The catalog contains complete structural details, dimensions, specifications, and prices for each unit in the line.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 53.

New Dealers for Davey Co.

Portable Tool Sales & Service, Inc., Chicago, has been named an authorized dealer for the Davey Compressor Co.,

Kent, Ohio. Located at 535 No. Cicero Ave., Portable will handle the complete Davey line, offer service and parts facilities, and maintain Davey rental units.

J. S. Larkin Co., 5 No. Front St., Harrisburg, Pa., is the new Davey dis-

tributor for several Pennsylvania counties. These include Dauphin, York, Adams, Cumberland, Perry, Juniata, Snyder, Union, Lycoming, Sullivan, Clinton, Centre, Mifflin, Huntingdon, Franklin, Lancaster, Lebanon, and Northumberland.

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The Mototruk power-driven hand dolly can be used for carrying loads of 1,500 pounds or less up inclines, over relatively long distances, etc.

Powered Hand Dolly

A 2-wheeled hand dolly, powered by a built-in gasoline engine, has been made available to the public by Comet Mfg. Co., 9253 Nicollet Ave., Minneapolis, Minn. It is designed to provide a power-driven unit in situations where there is no need for a costly or complicated 3 or 4-wheel power truck. It can be used for carrying heavy loads relatively long distances, up inclines, etc.

The Mototruk is built along the lines of a conventional 2-wheeled hand truck, and is said to be capable of carrying loads of up to 1,500 pounds. A chain drive transmits power from the engine to the axle. The engine is started by kicking a foot lever; speed is regulated by a throttle at the right handle.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 89.

Two New Scraper Pamphlets

Two new pamphlets on its hydraulic and cable-operated scrapers are now available from the LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa. The hydraulic-scraper pamphlet shows action pictures of the company's 4-yard unit at work on a variety of jobs. It illustrates the type of work to which these scrapers are best adapted. It also shows how the 2-wheel scraper can be used with most types of rubber-tired tractors of sufficient drawbar horsepower; and how the 4-wheel scraper can be used with track-type tractors

within the 35 to 55-drawbar-horsepower range.

The other booklet describes and shows job applications of the cable-operated scrapers. It lists production and cost figures and points out how maximum production can be obtained. The pamphlet is said to be a practical textbook on scraper design and on how design affects production.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 27.

Madden Heads Haiss Sales

A Sales and Division Manager of the Conveyor Division of the George Haiss Mfg. Co., Inc., has been named by its parent company, Pettibone Mulliken Corp., of Chicago. The man appointed to this position is W. E. Madden. The Haiss company, located in New York City, manufactures a complete line of material-handling equipment such as portable and stationary conveyors, bucket loaders, buckets, etc.

Drawing Instruments For Aerial Surveys

Equipment for use in evaluating and interpreting aerial maps and photos is made by the Abrams Instrument Co., Lansing, Mich. It includes a rectoblque plotter, Lazy Daisy mechanical triangulator, vertical sketchmaster, oblique sketchmaster, stereoscopes, contour finder, intervalometers, contact printer, printer timer, drying equipment, and explorer cameras.

The function of the rectoblque plotter is to correct for the convergence of detail from the plumb point of vertical cameras, and to find the true horizontal directions of all control points on oblique photographs. It is also used to draw lines representing the true horizontal control over large areas by using aerial photographs. This equipment is said to produce a mechanical radial-line control network, which accurately locates all selected points to their geographic positions by adjustments through orientation to known estab-

lished points on the map-plane base.

The oblique sketchmaster is an optical instrument used for transferring planimetry from an oblique photograph to a horizontal map plane. It is designed to cover the necessary area required in transforming tri-metrogon oblique photographs which are taken at an approximate 60-degree angle to the surface of the earth.

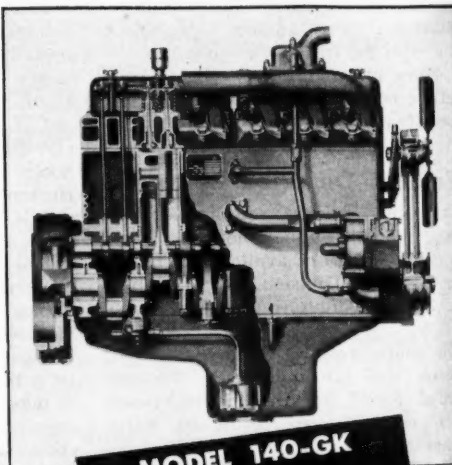
The contour finder is an instrument for delineating topographic detail and determining numerous elevations. In vertical aerial photographs, elevation changes cause relief displacements of images. It is possible to make measurements of this difference when two overlapping aerial photographs are properly oriented and viewed stereoscopically. The contour finder, it is said, can measure to 0.01 mm this parallax difference due to displacement, by employing a 4-power magnifying stereoscope and a pair of measuring dots.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 21.

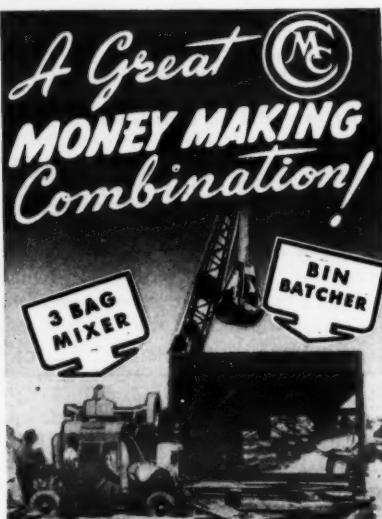
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To judge from their grins, they found it very agreeable to attend the Associated Equipment Distributors October regional conference (Region 11) at the Huntington Hotel, Pasadena, Calif. Left to right, front row, "they" are Frank G. Knight, AED Executive Secretary; Willis Blakeslee, Pneumatic Machinery Co., Los Angeles; Don Shaw, Los Angeles AGC; and A. F. Garlinghouse, Garlinghouse Brothers, Los Angeles. In back are Tracy Harron, honorary member, San Francisco; Frank B. McBeth, Chairman of the Advisory Board; Carl Baker, Smith Booth Usher Co., Los Angeles; G. G. Curto, Western Machinery Co., San Francisco; and Fred M. Viles, Fred M. Viles & Co., Spokane, Wash., Director of Region 12.

Kettle for Melting Rubberized Asphalt

A heating kettle for melting rubberized-asphalt joint compounds has been developed by W. G. Chausse, 4453 Fourteenth St., Detroit 8, Mich. This Model No. R-115 is divided into three distinct parts: the melting tank, heating tank, and the heat chamber.

The melting tank has a 115-gallon capacity. It is set in an oil bath so that all outer surfaces are in contact with the oil. The power-driven agitators consist of two sets of propeller paddles, heated with hot oil, with heavy springs at each paddle. They are said not only to agitate, but also to scrape the sides and bottom of the half-cylindrical melting tank. A cutting device has been developed using hot oil, to cut the cold compound and drop it into the melting tank. It is stated that these new features will decrease the operating time by 50 per cent.

The heating tank is designed to maintain the oil at an even temperature throughout. Oil is circulated by a power-driven pump. The heat chamber is equipped with an oil-circulating coil system of 2-inch pipe heated by two Chausse coil-type low-pressure oil burners.

The chassis is of the Chausse all-welded construction with pneumatic tires, fenders, towing tongue, and tongue support. The oil-circulating pump is powered by an air-cooled engine equipped with gear reduction and clutch. Valves are provided to fill the oil-heating tank and coil system by sections from the oil container, and to drain the oil system at any time. A mercury thermometer is provided to show the temperature of the oil. The outlet faucet is enclosed in a jacket through which hot oil is circulated to prevent a rapid drop in temperature as the compound is unloaded.

The unit uses two Chausse 3-inch burners to provide heat. Capacity of the fuel tank is 20 gallons; of the oil system, 85 gallons. The 3/4-inch oil pump is said to deliver 10 gpm. Overall length is 126 inches; width, 76 inches; height, 65 inches; and approximate weight is 2,300 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 4.

Cement Lining for Pipes

A method of producing a cement-mortar lining for water mains and pipes is described in a new catalog issued by the Centriline Corp., 140 Cedar St., New York 6, N. Y. The Centriline process can be used by water-works and pipeline contractors for reconditioning, reclamation of abandoned mains, protection of new steel mains, etc.

The catalog describes the Centriline machine for producing the lining, which throws a 3-minute mechanically-premixed cement-mortar against the inside

surface of the pipe by centrifugal force. It also discusses the range of applica-

bility of this process, the physical characteristics of the cement-mortar lining, and other data on research and test findings. The brochure also contains valuable design data for using this process.

Free copies of this literature may be obtained from the company or from this magazine by writing on your business letterhead.

Gravel-Washing Units

A catalog describing its line of equipment for washing sand, gravel, and other aggregates has been issued by the Eagle Iron Works, 129 Holcomb Ave., Des Moines, Iowa. Bulletin No. 47 includes data on how these washers work, what they will do, with what materials they can be used, and features of construction and operation.

The booklet tells about the water inlets on the single or double-screw machines. It shows views of the bearing protector and the method of attaching the flight to the conveyor

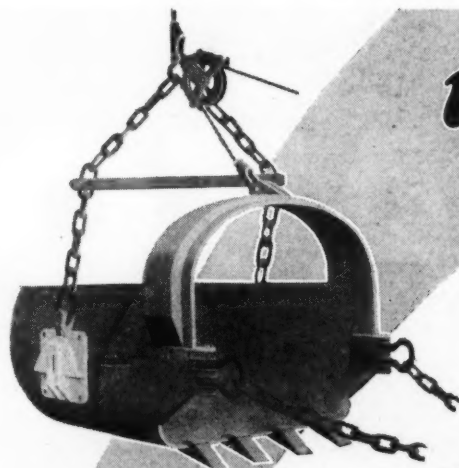
shaft; views of the upper gear end; of the drive-gear arrangement; of the water-lubricated bearing, etc.

Machines illustrated include the single or double-screw coarse-material washers, the single or double-screw fine-materials washers, the auxiliary shale remover, the Eagle sand tank, the dehydrators and classifiers, and other special equipment.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 59.

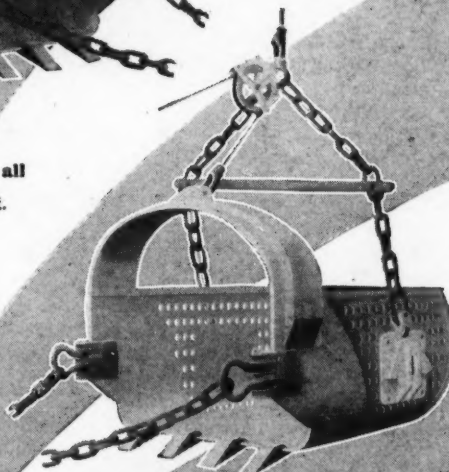
Pioneer Agent in Midwest

The appointment of Truman A. Dunn as Sales Engineer has been announced by the Pioneer Engineering Works, Inc., of Minneapolis. Mr. Dunn will cover the states of Kentucky, West Virginia, Ohio, Indiana, lower Michigan, and northern Illinois. He will make his headquarters at Bloomfield, Ind. Pioneer manufactures the Continuflo line of equipment for pit, quarry, and bituminous operations.



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Asphalt Undersealing Precedes Resurfacing

Maintenance Forces Check Pumping Concrete Joints Before Contractor Lays Plant-Mix on Old Road

♦ MAINTENANCE forces of the Kentucky Department of Highways worked in conjunction with a contractor's crew in the recent improvement of a 7.3-mile section of U. S. 60 between Louisville and Shelbyville, Ky. The old concrete pavement, which had given a lot of trouble with pumping joints, was first undersealed with asphalt and then surfaced with two courses of asphaltic concrete.

The undersealing was done by a special maintenance group of Highway Department employees who are correcting joint pumping on many of the state's concrete roads. The new hot-mix work was a contract job awarded to the Breslin Construction Co., of Louisville, Ky., for \$69,778.80. Both phases of the improvement were completed in a little over a month, extending from the latter part of May to the end of June, 1947.

The project was in Jefferson County, beginning 0.2 mile west of Middletown and running east to the Shelby County line. Badly cracked and over 20 years old, the existing concrete pavement is 20 feet wide over most of the job except at the west end where a 22-foot width had been constructed. The 7-inch-thick concrete slabs are non-reinforced, and have expansion joints at 30-foot intervals.

In a few locations the pavement had deteriorated so badly that no undersealing could be attempted. At such places the maintenance workers cut up the old concrete with pneumatic drills, and loaded it by hand into trucks for dumping along near-by fills. The holes were then filled in with concrete patches.

Preparatory Work

Holes for the asphalt undersealing were drilled through the concrete pavement at all joints that had given evidence of pumping out water from the subgrade. Other holes were also made

at cracks or seams that had developed in the concrete since the road was built. The maintenance foreman first went over the job, spotting where the holes were to be made with a piece of keel. The holes were made usually about 12 inches on either side or both sides of the joint or crack, according to conditions.

A 3-man crew, with the foreman, handled all the drilling. One drove an International truck and also operated the Ingersoll-Rand K-105 portable air compressor which was towed behind. The second man flagged traffic around the work, while the third drilled the holes. Drilling was done with a Chicago-Pneumatic drill fitted out with a 2-foot length of 1-inch hexagonal steel and 2 1/4-inch-diameter bits.



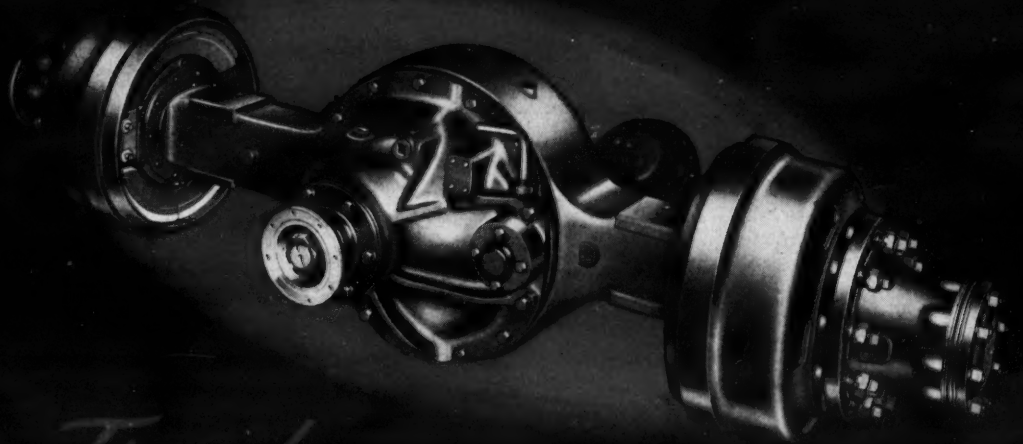
C. & E. M. Photo

Maintenance forces of the Kentucky Department of Highways recently undersealed a 7.3-mile section of U.S. 60 with 30 to 40-penetration asphalt. Here they pump it through a drilled hole from an Etnyre distributor mounted on a Studebaker truck.

The holes were filled with 30 to 40-penetration asphalt, some of which was shipped in bulk via tank cars to a

siding of the Southern Railroad at Shelbyville. Here the heavy asphalt (Continued on next page)

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was heated in the cars to a temperature of about 225 degrees F by means of a Littleford steam generator. Then a Grace circulating heater was hooked up to the car, raising the temperature of the asphalt to around 400 degrees F, and getting the thick bitumen circulating. This same heater unloaded the asphalt, as needed, through a 3-inch line into either a 963 or a 1,263-gallon Etnyre distributor mounted on a Studebaker and an International truck respectively.

At night the circulating unit was taken off the tank car and replaced with the steam generator which imparted enough heat to keep the asphalt from becoming thick. In the morning the two pieces of equipment were again switched in order to load the distributor quickly.

Some of the asphalt used in this work was supplied in 50-gallon drums which were split up into six pieces by an axe. The solid pieces were then dumped into a Littleford 300-gallon heating kettle and heated to 400 degrees F over the kerosene burners. At that temperature the distributor pump transferred the bitumen from the kettle to the distributor tank.

Undersealing Operations

An 8-man crew with a foreman handled all the operations of undersealing, which filled the voids in the subgrade beneath the concrete slabs. One, as flagman, kept traffic clear of the workers and equipment. Two were on the distributor as driver and operator. Another operated the 3/4-inch-diameter water hose, with the water supplied from an 800-gallon tank mounted on a GMC truck driven by a fifth worker.

The tank was filled either from city hydrants or at the maintenance garage in near-by Buechel. The water was used to wet around the hole both before any undersealing was done and also after it was over. It kept the asphalt from congealing on the concrete to make its removal difficult.

The remaining three of the gang worked with the hot asphalt. One handled the extra-heavy hose through which the distributor pumped the material beneath the concrete. At the end of the hose was a short length of double-strength pipe which was fitted with a cone-shaped block of wood for insertion into the hole. The cone was 5 inches long and had a 1 3/8-inch opening for the pipe. The pipe itself had a 1-inch inside-diameter bore. The wooden cone fit the holes snugly, preventing the asphalt from slopping out at the sides and getting on the concrete. During the pumping the hot asphalt often forced water up from the subgrade, either through cracks in the slabs or through holes way out in the shoulders.

From 5 to 25 gallons of bitumen was the average pumped into each hole, and only in 9 holes was it found impossible to pump any asphalt. A total of 45,000 gallons of material was pumped into nearly 4,000 holes in this improvement, which sealed up the subgrade and created a firm foundation under the pavement. Tilted slabs were also straightened by raising some corners as much as 2 inches.

As soon as no more asphalt could be pumped into any one hole, the man with the asphalt line pried the cone from the hole with a forked steel bar, while the worker with the water hose washed off any of the bitumen that may have spilled over. The seventh in the crew then plugged the 2 1/4-inch hole with a wooden plug, 3 inches long, which fitted tightly into the opening. To prevent the scalding bitumen from squirting up and burning the man during this operation, the wooden plug was fastened at the end of a steel bar 2 feet long, by means of a small point protruding from the metal.

A few sledge-hammer blows sufficed

to drive in the plug; afterwards the steel bar was lifted off. The bar had a round section at each end which helped to secure the plug in place and also made the driving easier. The remaining member of the force wielded a heated scraper to clean up around the holes, removing any of the material that may have escaped the action of the water hose.

Although these holes were drilled and the undersealing completed before the surfacing contract got to them, members of the maintenance force watched closely to see if any pumping occurred after the binder course of hot-mix was laid. In a few instances some signs of pumping were observed—a telltale streak of wet brown mud coming through the layer of asphaltic concrete. When that happened, additional holes were drilled through the binder course and the concrete below, and more of the 400-degree-F asphalt was pumped over the subgrade to seal up the remaining voids.

(Concluded on next page)

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tions. Maintenance is quick and easy, too. Whether you're buying new equipment or repowering old, it will pay you to investigate General Motors Series 71 Diesels first. Choose from "singles," "twins" or "quads," from 25 to 800 horsepower. See your equipment dealer, or write directly for further details.

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Asphalt Undersealing Precedes Resurfacing

(Continued from preceding page)

The maintenance program of the Kentucky Department of Highways is supervised by H. H. Palmer, Director of Maintenance and Equipment. Marvin C. Douglas was Foreman in charge of the asphalt undersealing operations.

Plant-Mix

This entire 7.3-mile section was then surfaced with two courses, binder and top, of plant-mix. They were laid at the rate of 150 and 100 pounds per square yard respectively. When compacted by rolling, the binder course was 1½ inches thick, while the top course was 1 inch thick. A stretch of 2,800 feet was skipped at the approaches to the bridge over Floyd Fork Creek, since a new bridge is listed in the construction program of the Highway Department.

The Breslin Construction Co., of Louisville, which had the contract for furnishing and laying the asphaltic concrete, had a Cummert asphalt plant already set up near the town of Speeds, Ind., on U. S. 31. Although this plant was 26 miles away across the Ohio River, the contractor decided to use it for the Kentucky job.

A fleet of 35 trucks, of various makes but averaging 8 tons per load, was engaged to haul the hot-mix. The hauling contract was given to George Maddox of Speeds, who was paid on the ton-haul basis. The loaded trucks were covered with tarpaulins so that the contents lost little heat, and the material was delivered to the job at temperatures between 280 and 325 degrees F. A truck took 2½ hours for the round trip.

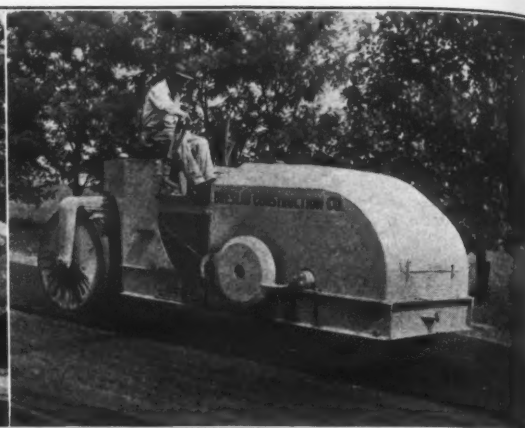
Before any material was laid on the road, a tack coat of RC-2 was first applied half the width of the road at the rate of 0.1 gallon to the square yard. A Littleford 1,000-gallon distributor shot the bitumen which was heated to between 175 and 200 degrees F. It received its load at the asphalt plant which is on a siding of the Pennsylvania RR. Texaco asphalt was used for the tack coat and also in the plant-mix.

The hot-mix was laid by a Barber-Greene finisher. It was rolled first by a Gallion 10-ton tandem roller and then by a Huber 10-ton 3-wheel roller for



C. & E. M. Photos

Plant-mix surfacing on U.S. 60 in Kentucky was laid by contract. Breslin Construction Co. used a Barber-Greene finisher; it is pictured at left laying an 11-foot lane of binder course, as a White truck discharges 8 tons of plant-mix to its hopper. A Gallion 10-ton tandem roller, pictured at right, gives the hot-mix its first rolling.



the back rolling. The usual procedure was to work on one-half of the road in the morning, and complete that section in the afternoon. An average of 950 tons of material was laid in a 10-hour day. The binder course was first laid throughout and was followed by the top course. The finished surface has a center crown of 1¼ inches.

The contractor employed a force of 15, not counting the truck drivers. The plant crew consisted of a foreman, operator, and three laborers. Two men worked the distributor—driver and operator. Two flagmen maintained traffic during the construction. The surfacing crew included the finishing-machine operator, two rakers, two roller men, and a laborer.

The gradation of the stone used in both courses of the mix is given in the following table:

Sieve Size	Per Cent Passing	
	Binder Course	Top Course
1-inch	100	....
¾-inch	90-100	....
½-inch	....	100
¾-inch	55-80	90-100
No. 4	35-50	50-65
No. 8	25-35	35-50
No. 16	0-15	20-40
No. 30	0-5	2-20
No. 100	0-5	0-10
No. 200	0-5	0-5
Bitumen (85-100 penetration)	4-7 per cent	4-8 per cent

Quantities and Personnel

The contract included only the following three items:

Binder course	7,455 tons
Top course	4,970 tons
RC-2 tack coat	9,940 gals.

E. P. Moynahan was Superintendent

for the Breslin Construction Co. J. P. Marshall was Resident Engineer for the Kentucky Department of Highways,

which is headed by T. H. Cutler, Chief Highway Engineer. Cabell B. Owens is Director of Construction.

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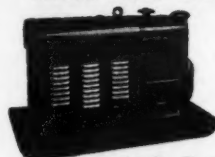
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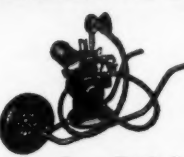
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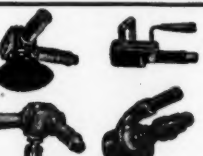
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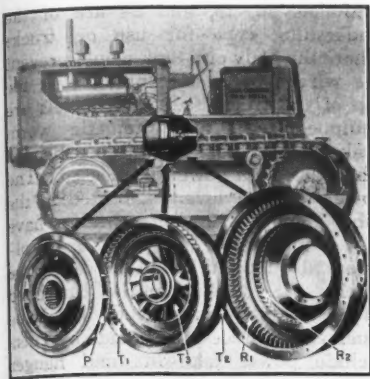
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Disassembled and removed from its housing, the three-stage hydraulic torque converter found in the new Allis-Chalmers HD-19 is comparable to three paddle wheels in the water. It is the flow of oil against the "driven" and "reaction" blades on these wheels which automatically balances torque against speed to meet load conditions of the tractor.

Fluid Unit Balances Torque Against Speed

A feature of the Allis-Chalmers HD-19 diesel tractor is its hydraulic torque converter. The purpose of this unit is to adjust the speed of the engine against the load applied to the tractor—just as the gears of automotive equipment are shifted to balance power against speed. With this unit, however, an infinite number of gear-reduction ratios are obtainable, without the need for shifting gears in any one of the tractor's two speed ranges.

A simple hydraulic unit of the fluid type consists of two movable members contained in a chamber filled with a liquid—usually oil. When the engine is running, the member known as the driving member is turning with it. This member is built with radial fins leading from the hub to the outside edge. As the shaft revolves, oil is forced outward by these fins. This moving oil then strikes similar fins on the driven member, causing it to rotate. This type of one-stage hydraulic coupling or fluid flywheel is simply a centrifugal clutch, and is not a transmission. It does not increase torque—twisting or turning effort—nor can it balance engine speed against load.

However, from this simple coupling can be developed the torque converter which will automatically increase torque delivery by sacrificing speed. In principle, all that is required is to add another set of blades—stationary or reactionary. These blades, tied solidly to the frame, will produce a reacting force to multiply torque.

The three-stage torque converter found in the new Allis-Chalmers HD-19 is comparable to three paddle wheels in the water, arranged in a row and connected by roller chain and sprockets. Actually, the three sets of blades are combined in one wheel on a single shaft, and the fluid is directed to strike one set of blades after another. The impeller wheel, or driving member, is connected to the engine by means of, and through, the master clutch. Next is the turbine wheel with its three sets of blades connected to the transmission by means of a short spline shaft. When all these parts are assembled, the impeller wheel fits into the inside diameter of the turbine wheel, and both wheels are then assembled into the converter housing.

We can best follow the flow of liquid, and the transmission of torque, by means of the accompanying illustration. The fluid is first thrown by centrifugal force away from the impeller (P) and strikes the first set of blades on the turbine wheel (T₁). Although the fluid comes off this first set of blades with full force and turning effect, it is traveling in the wrong direction for the next set of blades. To correct this and offer a means of multiplying torque, the oil next strikes the first set of reaction

blades (R₁), which correct its direction for a new push against the second set of driven blades (T₂). The fluid, still under high velocity, comes off the second set of reaction blades (R₂) where its direction is again changed. And with a new push it is directed against the third set of turbine-wheel blades (T₃) for its third and last turning effort. After completing this cycle of events, the fluid returns to the hub of the assembly where the routine is started over again.

The blades are definitely and accurately positioned in the assembly, and the turbine wheel is connected to the transmission, which in turn moves the tractor. With a maximum load on the tractor, the turbine wheel is motionless and at that time the angle at which the fluid strikes the blades is greatest. Due to the centrifugal motion of the fluid, this condition causes the maximum turning effort in relation to the blade angle. As the turbine wheel begins to turn and increase in speed, the angle at which the fluid strikes the blades be-

comes less effective; as a result there automatically exists a variation in torque characteristics. Briefly, any increase in the load will tend to slow down the driven member which then calls for an increase in torque. This is automatically provided as the fluid strikes the blades at a sharper angle. Thus the torque converter is a device which automatically balances torque against speed to meet load conditions.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 36.

Spreaders in Many Models

Descriptive literature on spreaders for use with sand, stone, chips, salt, or cinders is available from the Brokol Mfg. Co., Inc., 94 Madison St., Newark, N. J. These spreaders are made in various sizes and styles to fit their many purposes.

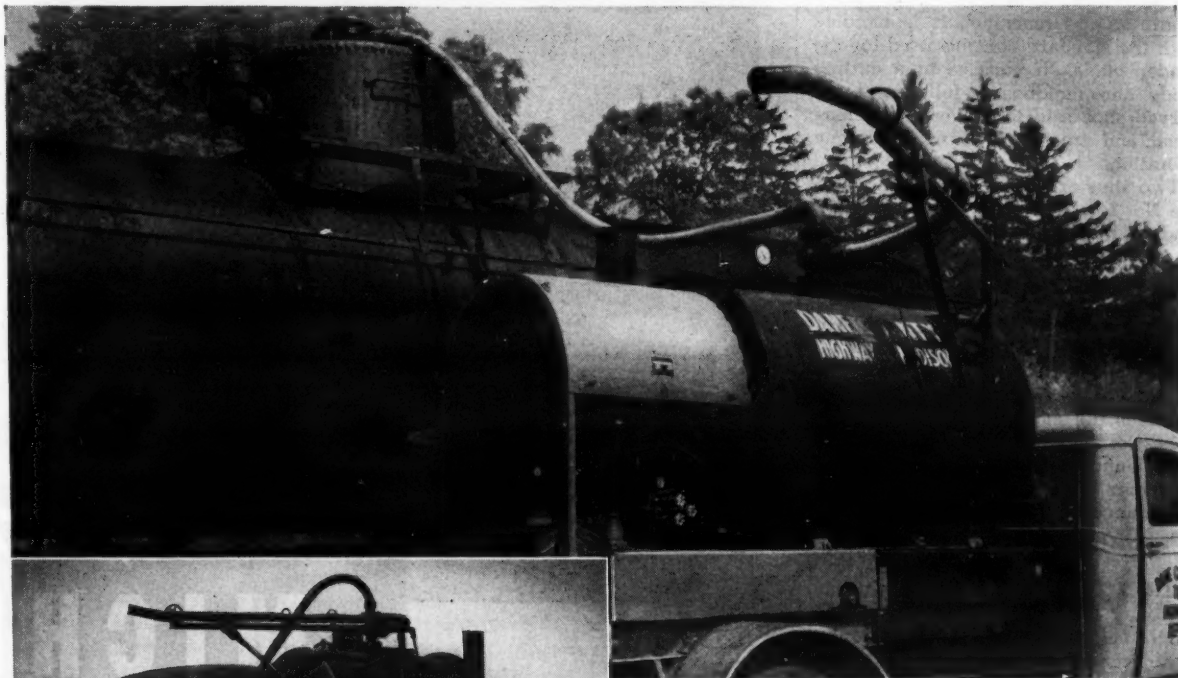
The folder shows pictures of the models and lists details of operation. It tells how the spreaders are attached,



the size of materials for which they are designed, their dimensions, wheel sizes, and other relevant data.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 84.

All hooked up and ready to deliver hot oil... fast!



Truck-mounted Booster. Heats by direct firing. Loads direct to distributor or returns to tank car. 2 sizes for truck or trailer mounting.



Check These Advantages

- Heats material 3 times as fast as steam.
- Heats to higher temperatures.
- No steam or water necessary.
- Heats only amount of material required.
- Circulates material while heating—no separation or damage—assures uniform application.



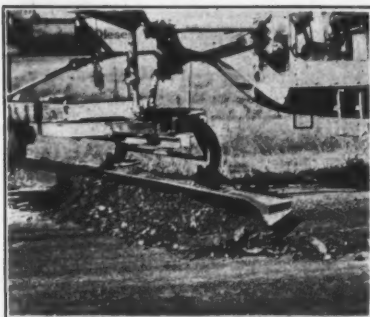
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The Beadle oil-road smoother attachment for motor graders is said to trowel and pulverize old oxidized bituminous surfaces; create heat for livening up the bitumen; and then spread, smooth, and compact the new wearing surface.

Oil-Road Smoother Levels Old Surfaces

An attachment for reconditioning old asphalt, oil, or tar surfacing is made by the Coates Mfg. Co., Corydon, Iowa. It is said that the Beadle oil-road smoother will, in one operation, do the work of disk, maintainer, pulverizer, and roller. The manufacturer also states that it will trowel and pulverize the old oxidized bituminous surface; create heat for livening up the bitumen; and then spread, smooth, and compact the restored material into a new wearing surface with a few passes of a motor grader.

The Beadle attachment is designed to fit on most standard makes of motor grader by replacing the regular moldboard on the machine. It is handled with the standard controls used for the grader blade. It consists of a cutting blade and moldboard, followed by a curved shoe said to pulverize the material and smooth the surface in one operation.

Two shoe attachments are available: the No. 1, a one-piece removable unit made of high-carbon cast steel; and the No. 2, with removable 2-foot sections of abrasive-wear-resisting steel 1 inch thick, and with the shoe extending farther back than on the No. 1. Height of the moldboard with cutting edge is 15 inches; length of moldboard is 12 feet; length of the smoother shoe is 10 feet; widths of the shoe are 19 inches and 25 inches; and the approximate weight is 1,800 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 31.

Long Grasping Tool

A claw type of grab tool on a long handle can serve many purposes on a construction project. It can be used for removing spacer bars from concrete forms, for picking out small solid objects which fall into the forms, and for other similar purposes.

One such tool available to contractors is the automatic spring gaff, Model No. 2, made by the O. A. Norlund Co., Williamsport, Pa. This tool consists of three claw teeth mounted in such a manner that the two outer jaws are pivoted to the center one. When the long-handled tool is applied to an object and lifted, these outer teeth clamp down and hold with a firm grip until the pressure is released.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 9.

Grass, Weed, Brush Mower

A power-driven rotary-type mower for cutting grass, weeds, brush, and for related uses is described in a bulletin released by the City Sales Co., 323 W. Polk St., Chicago 7, Ill. This unit is so constructed, the company says, as to permit mowing right up to curbs, fences, or other vertical objects while moving parallel to them.

Here are some of the features of the OK mower which are listed in this folder: power is furnished by a 1½-hp engine; the mower is mounted on a

two-wheel dolly, with the wheels following in the path which has been cut; a pan underneath the cutting head protects moving parts, and permits close-to-the-ground mowing without danger of the blade digging, or skinning, ground surfaces; there is a saw attachment for cutting trees; and blades can be sharpened while attached to the cutting head.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 78.

Power Winches Mount On Trucks and Tractors

A line of power winches for use on trucks and track-type tractors is offered to the construction industry by Tulsa Winch, a division of Vickers Inc., 815 E. First St., Tulsa 3, Okla. These vary in size from the Model 10 to the Model 80 and are said to be adaptable to a full range of truck sizes. Ratings, safe working loads, and breaking loads

listed are those given in the manufacturer's specifications.

Models 10 and 12 are designed for ¼ to 1-ton trucks and are said to have a safe working load of 3 tons on the bare drum with an approximate breaking load of 10 tons. Models 18, 19, 21, and 23 are designed for installation on 1½ and 2-ton trucks. All but No. 23 are said to have a safe working load of 6 tons with an approximate breaking load of 22½ tons. The listing given for Model 23 is a safe working load of 7½ tons and a 26½-ton approximate breaking load. Models 24, 34, and 36 are for 2 and 3-ton trucks; their safe working load is 12½ tons on the bare drum with an approximate breaking load of 37½ tons.

Models 64 and 65 are for 3 and 4-ton trucks; safe working load is 17½ tons, and breaking load is 50 tons. Models 70 and 80 are for 4-ton trucks and larger. For Model 70, the safe working load is 25 tons and the breaking load is 75 tons. Corresponding listings for Model 80 are 32½ tons and 100 tons.

Models 12, 18, and 24 are of the underslung type for use on trucks where the body or a tank would prevent the wire rope from running over the top of the truck bed. All models are equipped with an automatic worm brake said to hold the load suspended when the input power is released. The power take-off lever is located in the cab. Models with drum brakes have the drum brake and clutch control-levers also located inside the cab of the truck. All models can be furnished with extended niggerheads for wide truck cabs. Accessories made by Tulsa include power take-offs and hanger bearings.

Models 23, 34, 64, 70, and 80 are designed for use with track-type tractors, with the winch transmission built for tractor winch use. Models 23 and 34 have two speeds forward and one reverse; Models 64, 70, and 80 have three speeds forward and one reverse.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 3.



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POWER SHOVEL COMPANY

BENTON HARBOR, MICHIGAN



The brightly colored cone of this runway light is designed to identify the location by day, and a light provides a nighttime marker.

Raised Runway Light

A new marker light for airport runways has been developed by the Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. It is designed to meet CAA Specification No. L-802. The brightly colored cone is said to identify the runway or strip in the daytime, while a light at the top provides an elevated marker at night.

The lens assembly is designed to give asymmetric light distribution with the major portion of the light in line with the runway. Lenses and frame are indexed, and the entire assembly can be oriented by rotating the lens and cone support on the shaft. Rifle sights enable the unit to be aligned with the runway when it is installed, or after relamping.

The lights are designed for use on either a 6.6-amp-series circuit, or a 120 to 240-volt multiple circuit. Five steps of brightness are available, ranging from 16 to 1,600 candlepower when a 30-watt-series lamp is used. The circuit is controlled by a standard 5-step brightness-control regulator.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 2.

Wellpoint-System Catalog

A 72-page catalog, "Griffin Pointed Wellpoint Facts", is ready for distribution by the Griffin Wellpoint Corp., 881 E. 141st St., New York 54, N. Y. The catalog contains the latest information and photographs on the use of a wellpoint system for unwatering wet excavations and for installing emergency as well as permanent water-supply systems.

Photographs and line drawings show typical wellpoint layouts and case histories of Griffin units in use on jobs throughout the United States. The catalog also shows the construction of the Interflow well screen, the design of the patented point, the flexible and standard swing joint, and other component parts.

Six pages of data on Jetting Pumps, with on-the-job illustrations, are included.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 94.

Story of H. O. Penn Co.

A booklet telling of its organization and services has been put out by the H. O. Penn Machinery Co., Inc., 140th St. and East River, New York 54, N. Y., well known equipment distributor. The booklet tells of Penn's stock of 500,000 genuine parts, shows pictures of the members of the Penn staff, describes its in-the-shop and on-the-job repair facilities, and lists its four offices and maintenance shops located in New York City, Poughkeepsie, and Mineola, N. Y.; and at Newington, Conn.

It points out the drama in man's use of modern construction equipment to change his future by building high-

ways, bridges, airports and other structures that reshape the earth.

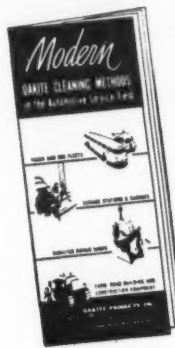
Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 68.

Drill for Concrete

A drill for boring holes in concrete, brick, masonry, and similar materials is being distributed by the Concrete Termite Sales Co., 2301 Main St., Santa Monica, Calif. According to the manufacturer, the Concrete Termite rotary drill will operate without cracking the material or deviating from a straight line. It is said to depend on a patented rotary pulverizing action rather than on sharp cutting edges or hammer-like blows.

The Termites may be used with any electric drill. They are available in 1/16-inch sizes from 1/4 to 1 1/2-inch diameters.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 25.



This Free Manual

can help you lower equipment servicing costs.

36 pages of money-saving service shop cleaning procedures you will want to know about! Time-saving ways to steam-clean motors and chassis . . . recondition clogged radiators . . . clean cooling systems . . . degrease parts before repair. And many other improved job-cleaning procedures. Write NOW for your FREE copy. No obligation.

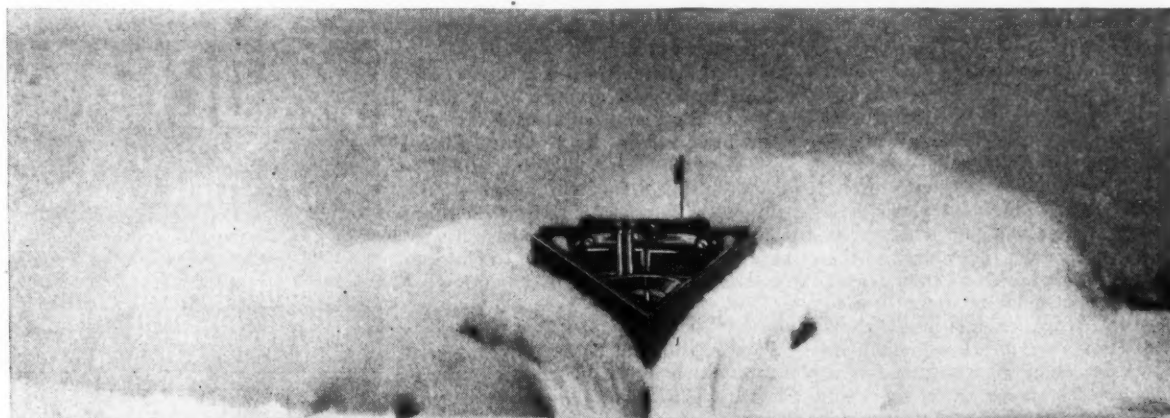
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Without traction, a truck is helpless on snow and ice. With limited traction, much of its power is wasted. But with full traction, as provided only by Walter Snow Fighters, every ounce of engine power is put into fast pick-up, sustained high speeds and tremendous pushing force.

How is this obtained? Through the Walter 4-Point Positive Drive, with three automatic locking differentials which concentrate engine power on the wheels having traction, at all times. There is no wheel-spinning, stalling or side-slipping. So great is the traction, that many highway departments operate successfully without using chains!

This tremendous traction, power and speed permit you to mount the biggest, most efficient plows and remove a greater volume of snow on each run. You clear your routes faster, throw snow farther, blast through deepest drifts.

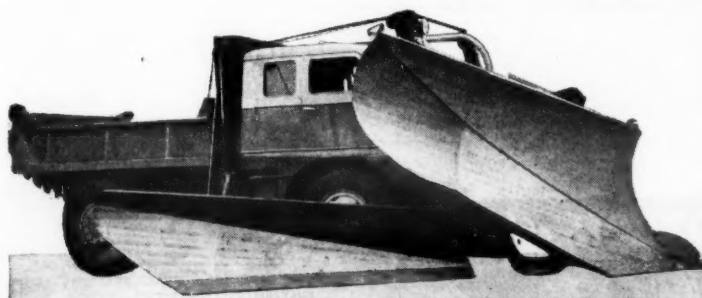
Ask your Walter distributor for detailed facts and figures. Literature sent upon request.

Full traction, with less ballast

● Walter Snow Fighters provide full traction with much less ballast than other trucks. There is less deadweight to cut down speed and pushing power. There is less danger of overloading small bridges and roadways of limited tonnage capacity.

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WALTER SNOW FIGHTERS

Rock-Handling Licked For Big Breakwater

(Continued from page 2)

stone was stockpiled, to be ready later on when work was proceeding at high speed on the breakwater.

The rock quarried nicely. It fit specifications well. Class A cap rock was produced in pieces 5 to 15 tons, with the average weight of all pieces about 10 tons.

Class B slope rock was broken in pieces from 3 to 7 tons each, with half the production weighing 5 tons or more. The Class C core-rock specifications called for finer particles up to 4 tons. Not less than 40 per cent had to weigh 600 pounds and more. Not less than 60 per cent weighed better than 200 pounds, and only 5 per cent of "dirt" less than 5 pounds was allowed. The Preston Island quarry, however, contains very little dirt.

The 2-mile haul road between Preston Island and the breakwater was dressed daily by a Caterpillar No. 112 diesel motor grader. It passed generally through the outskirts of Crescent City, and travel on this street was restricted mostly to the loaded Euclid fleet. High-gear speeds were maintained with the aid of a truck-mounted sprinkler to keep down the dust.

Ten end-dump Euclids, which averaged 15 tons per load per trip, transported the rock from the quarry to the end of the breakwater. As they passed the Government office near the breakwater, the Army engineers weighed each load on a set of Howe platform beam scales. Once each day the tare weight of each truck was checked. Tonnage on each load was then entered on a triplicate report, and used later as a basis for payment.

Transfer Platform Built

Building a transfer ramp to permit the trucks to dump their loads directly to dump scows and a crane barge was another pre-construction activity. This platform was built out near the end of the old jetty, on the inner side at a turnout. It consisted basically of a wood-pile dock, with a truck ramp that could be raised or lowered as the tide ebbed or flowed.

The end of the ramp was supported by four-pile dolphins, with an 18-inch



C. & E. M. Photos

At the Preston Island quarry which Basalt Rock Co. opened up for its breakwater contract, Northwest shovels and end-dump Euclids handled and transported the stone. In the left photo, we see part of the large stockpile that was built up. In the right photo, a Northwest 80 shovel loads a heavy stone into a Euclid.



I-beam across the top to carry the weight. Two big 6-way blocks with cable reeved to two old niggerhead drums raised and lowered the ramp. A General Electric motor furnished the power. A portable Caterpillar-Louis Allis 85-kw generating set furnished electricity for this motor, and for lighting the dock at night.

Loaded Euclids backed in to the end of this ramp and dumped their loads either to the dump scows used for core work, or to a crane barge which placed the Class B stone along both toes. This barge had a 315-cfm Ingersoll-Rand compressor and an American hoist on board to handle lines, or, in case it was taking on rock, to hold itself in close to the dock.

Rock-Placing Methods

Practical difficulties of building the big breakwater in open water were enormous. Considerable thought went into the method of placing rock. Despite heavy swells and crosscurrents, the operation proceeded nicely.

With 6 x 6-foot square targets set on the old jetty to mark both toes of the new work, two toe windrows were built of Class B derrick stone. These stones were handled by a Northwest 95 crane, mounted on a 36 x 130-foot steel ocean-going barge.

The barge was spotted so that its center line coincided with the target line, and rock was swung 10 feet outside the barge hull and dropped to the toe. During this work the barge was held in place by steel lines from all four corners, run by tug to four war pontoon

buoys. An 8,000-pound Navy-type anchor with 90 feet of chain on each pontoon held these floating anchorages in position. The loaded barge was brought out between the pontoons by one of three 200-hp tugs assigned to the

job, and lines run out to the pontoons by a second launch. The air-powered hoists aboard the barge then racked it into position for the placing operation.

The barge was loaded at the transfer (Continued on next page)

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ramp, moved out to position generally on a rising tide, and the big stones handled to their final resting place by an Owen grapple on the Northwest crane.

As the huge toe stones were placed, a part of the cross section of the high pile fell naturally into the space reserved on job plans for small core rock. Thus, with the addition of this extra quantity of heavy rock, the contractor built a stronger breakwater than specifications demanded—another example of how no cost was spared to build a sound structure. The two toes were placed up to a general elevation of minus 8.

When the toes were in, two 750-ton bottom-dump hopper-type barges took over to place the smaller core rock. Euclids loaded these barges at the transfer ramp. Tugs towed the ponderous loads out on the center target line, and ran the range due southeast, the direction of the breakwater alignment. When the dump foreman gave the signal, the bottom doors were knocked open and the big 500 to 600-ton loads of rock dropped in place neatly between the two derrick-stone toes. Dumping continued until the core built up to its designed elevation of minus 6.

There was great danger in leaving the breakwater very much exposed at this stage; in fact, specifications stressed the point that not more than 300 feet of core could be exposed at any one time without the heavier armor protection in place. Therefore as fast as the toe and core moved out to sea, the heavy Class A slope and cap rock had to be placed.

A new Lima Model 1201 crane, with an 80-foot boom and special rock grapples designed by Basalt Rock Co., was used to place the above-water section from the top of the breakwater.

Every effort was made to get all possible interlock between the big pieces of slope and cap rock; the pieces were fitted together. For there is a heavy suction on the sides and top of a breakwater as heavy ocean swells break over it. If the rocks are anchored by interlock, the water cannot move them. Too much emphasis cannot be placed on the importance of working carefully to get all this interlocking effect, according to Superintendent Ilsley.

With 57,900 tons of Class A rock, 81,900 tons of Class B rock, and 120,500 tons of core rock in the 1,000-foot extension, Basalt Rock Co. equipment kept roaring day and night to complete the breakwater as rapidly as possible. Two truck turnouts 500 feet apart were built as the big rubble barrier pushed out to sea.

Removing Underwater Obstructions

The most spectacular feature of the Basalt Rock Co. contract with the U. S. Engineers was demolition by high explosives of underwater pinnacles within Crescent City harbor. Their removal will make the inner bay behind the old breakwater safe for small fishing craft to navigate.

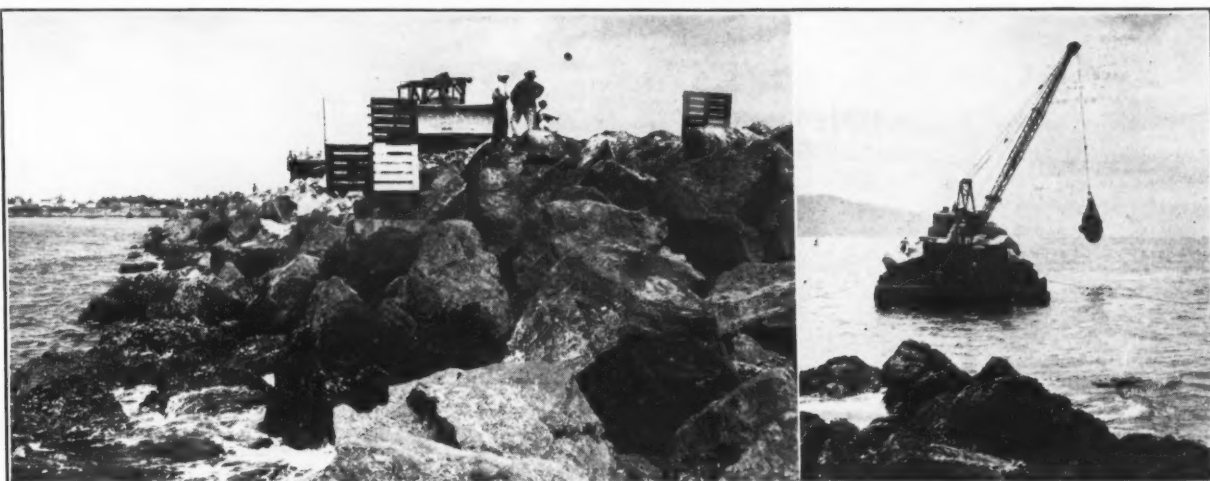
About 790 cubic yards of rock had to be blown to bits under this part of the contract. All the specifications said in regard to it was that the areas would be swept with a drag to make certain all the rock was removed, and that the methods used were optional with the contractor.

Exactly how to go about getting rid of submerged rock shoals to a depth of 12 feet below mean lower low water, with a single blast, was no mean problem to solve.

Decide to Drill and Shoot

It was decided to try the latest improved technique of drilling the heads with a big-diameter bit, spacing the holes relatively close, going down 8 feet under the grade line, and loading to capacity with special high-velocity explosives.

A Bucyrus-Erie Model 29-T churn



C. & E. M. Photos

The finished Crescent City breakwater will look something like this view at left. It was photographed from the end, looking shoreward. It also shows the 6 x 6-foot targets the U.S. Engineers set up to guide the dump barge. At right is the Northwest crane mounted on a 36 x 130-foot barge, which used an Owen grapple to bring the big Class B stones to their final resting place.

drill was brought in and mounted on a pontoon barge to drill the blast holes.

It is an electrically powered rig, and took its electricity from a Caterpillar-

Louis Allis 85-kw portable generating (Continued on next page)

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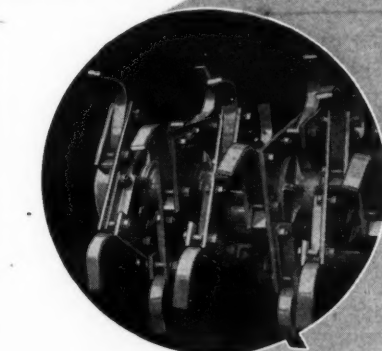
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Many contractors who have made highly profitable use of the SEAMAN MIXER through the road construction season, — add to their profits during the winter months by converting the SEAMAN for use in the removal of ice and frozen drifts from highways, streets and runways.

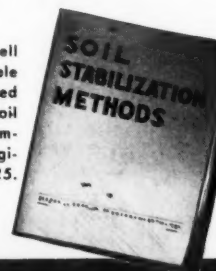
A low cost, interchangeable rotor equipped with special tines and depth control is quickly installed. Re-conversion at the end of the winter back to a mixing unit is equally simple.

The SEAMAN is recommended specifically for

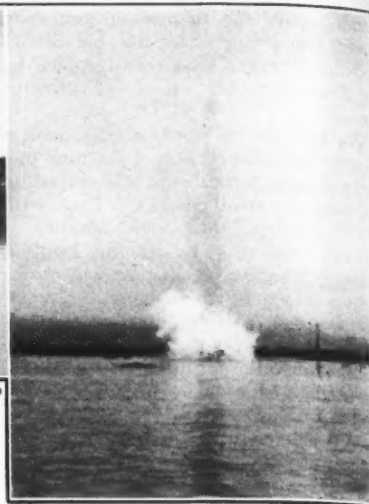
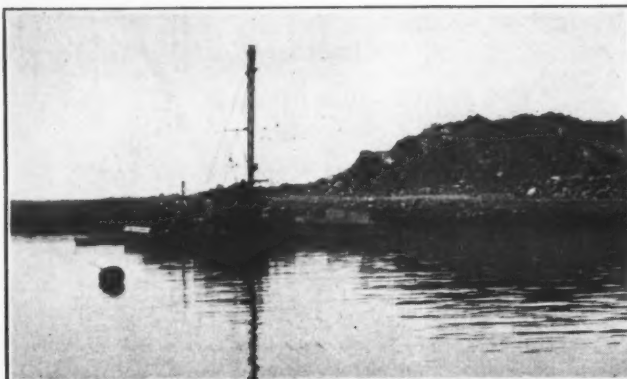
1. The shattering of ice up to as much as 3" in thickness on paved surfaces to facilitate removal.
2. When fragmentation is impossible due to certain conditions of ice, — to grind the ice surface down to rut-base level in order to remove dangerous ruts and irregularities.
3. To roughen the surface of slippery areas when time does not permit more complete treatment. This in turn also greatly increases the efficiency of sand or other material which may be subsequently applied.
4. To penetrate and pulverize hard, frozen snow drifts which are damaging or impossible to handle with conventional snow removal equipment.

5. To pulverize rough, compacted snow on airfields to permit mechanical re-compaction for hard, level runways, — or to facilitate leveling by blade or plow.

The handling of ice as well as many other profitable applications are described in detail in the book "Soil Stabilization Methods" compiled by SEAMAN engineers. Ask for Bulletin E-25.



SEAMAN MOTORS, INC.
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C. & E. M. Photos

Demolition by high explosives of underwater rock pinnacles within Crescent City harbor was the most spectacular part of the Basalt Rock Co. contract. The Bucyrus-Erie Model 29-T churn drill shown at the left, mounted on a pontoon barge, drilled 9-inch-diameter holes. Then a powderman and his helpers moved up to the holes with a skiff full of 60 per cent du Pont high-velocity gelatin powder in cartridges. They are shown in the center photo unloading the cartridges from the skiff. In the rubber pontoon float are Army civilian surveyors. The third photo shows the end of a rock pinnacle, as particles shoot up in the air in a column of water.

Rock-Handling Licked For Big Breakwater

(Continued from preceding page)

set mounted on the stern of the pontoon barge.

Carrying a 3,500-pound tool string with a 9-inch-diameter churn-drill bit, the 29-T machine punched down holes at the rate of between 3 and 4 feet per hour. They ranged in depth from 2 to 12 feet of shoal, plus the below-grade drilling which insured complete demolition of the head at one blast.

Trouble developed early in the job, however, because some of the rock was ravelly. After the drill finished, the hole filled up before the powdermen could get it loaded. Consequently the holes were drilled on 10-foot centers by casing the start with a 12-inch standard pipe. This also acted as a stable spud, and as soon as it dropped down to good bedding the anchor lines could be cast loose and the barge allowed to swing around at will. The inside of the bay is not too rough for this kind of work, except in storms.

When the drill had bored the big 9-inch hole to a point 8 feet below grade, the drill bit and stem were pulled out and a special 22-gage sheet-metal tube 8 1/4 inches in diameter was slipped in place to the bottom of the hole. This prevented any sloughing or cave-in action.

Just as soon as all the holes on one shoal were drilled, and the barge could move over to the next location, a powderman and his helper moved up to the tubes with a skiff full of 60 per cent du Pont high-velocity gelatin powder

in big cartridges 5 x 18 inches. The metal tubes were crammed as full of this high explosive as possible, and filled at least to the top of the rock.

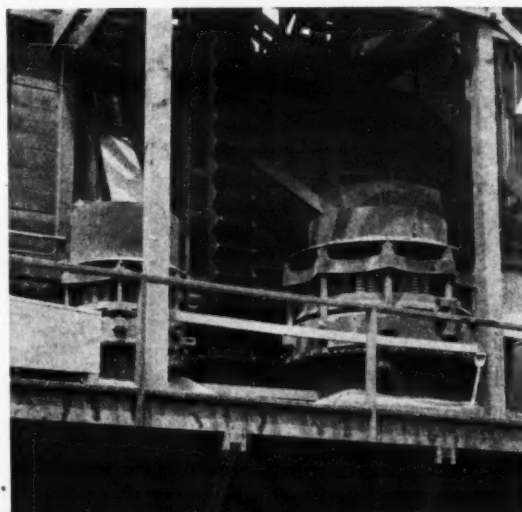
"Maybe we waste a little powder,"

Ernie Isley remarked, "but we're mighty efficient with that one-shot treatment."

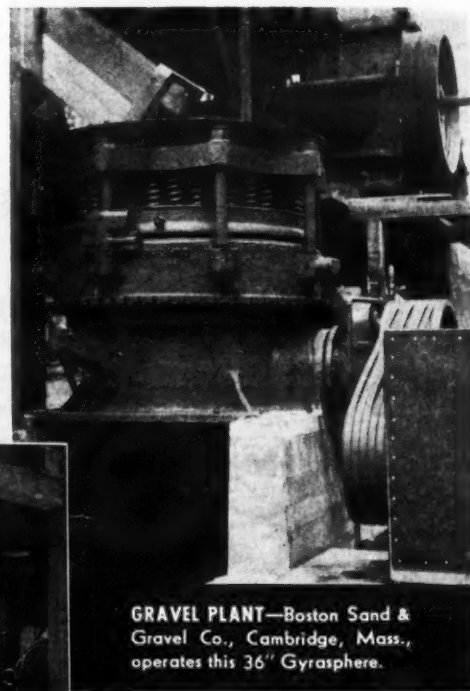
When the powder was in place, the tubes were gently lifted out and stored

in the skiff. The "Roman Candles", as the dynamite sticks were called, were tied with Primacord detonating fuse, which led up to the top of the water.

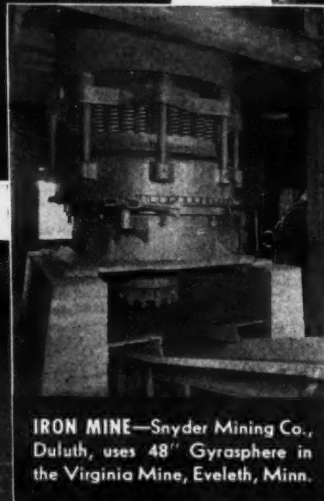
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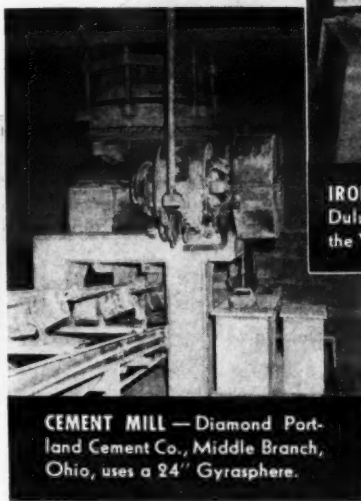
QUARRY PLANT—Arundel Corp., Baltimore, Md., operates six Gyrasphere Crushers of all sizes.



GRAVEL PLANT—Boston Sand & Gravel Co., Cambridge, Mass., operates this 36" Gyrasphere.



IRON MINE—Snyder Mining Co., Duluth, uses 48" Gyrasphere in the Virginia Mine, Eveleth, Minn.



CEMENT MILL—Diamond Portland Cement Co., Middle Branch, Ohio, uses a 24" Gyrasphere.

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All Primacord leads went to a single stick of 60 per cent gelatin, with a 7-minute fuse to allow the skiff to get out of there.

The powderman touched a match to the fuse. It caught. The oarsman rowed frantically away from the spot as a thin blue wisp of smoke rose off the water. Men—and seagulls too—watched that spot with fascination.

"Whoom!"

The whole ocean bottom seemed to rise as the concussion hit the hull of boats in the bay. Rock disintegrated. A column of water rose 500 feet in the air and drifted back down. Even before the smoke had cleared, the seagulls were there to pick up all the dead anchovies killed by the blast. Government surveyors came out, too, to sweep the spot. They reported that with the one-shot treatment they found no more shoal. In fact, the high explosive dished out a cupped place on the harbor floor.

It took a few weeks to progress with this system to the point just described, but after that it worked remarkably well. Close centers, big-diameter holes, which all add up to plenty of powder per cubic yard of shoal, seemed to be the secret of success.

By pushing this work during the calm weeks of summer weather, Basalt made certain that this very important part of its contract was also finished by October, when the main breakwater was scheduled for completion.

Personnel

The job was designed and administered under the general supervision of Colonel S. N. Karrick, USA, District Engineer for the San Francisco Engineer District of the Corps of Engineers. On-the-job officials for the Corps of Engineers included Resident Engineer H. S. McBride and his assistant, H. F. Brock.

Basalt Rock Co. was represented by Superintendent E. L. Isley, Quarry Superintendent Johnny Meloni, and Henry Dale, in charge of all water activities.

Bad-Weather Suit

Efficiency of snow-fighting crews and emergency gangs sent out against the elements depends in part upon how well protected they are by bad-weather gear. A suit designed to fill this need is made by the Interstate Mfg. Co., Hudson, Mass., and distributed nationally by Hatheway & Patterson Co., Inc., 100 South Bay Ave., Boston 18, Mass. The Interstate lineman's suit is said to be waterproof, windproof, and sleet-resistant.

The suit is worn over regular clothing. It is made in four sizes: small for 34 to 38-inch chests; medium for 38 to 42-inch chests; large for 42 to 46-inch chests; and extra-large for 46 to 50-inch chests. Other sizes can be made to specifications on request. Accessories include a small-parts pouch, a waterproof clothing bag, and a glove bag. The suit does not become stiff, brittle, sticky, or tacky in temperatures from 120 degrees to minus 40 degrees F, says the manufacturer.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 13.

Dealers for Wright Trailer

Additional distributors for its Trans-all-Tiltload trailers have been announced by the Wright Trailer Co. of Pasadena, Calif. They are: Foley Tractor Co., Wichita, Kans.; Falls City Sales Co., P. O. Box 776, Louisville, Ky.; Rosenwald-Cooper Inc., 1955 University, St. Paul, Minn.; Sanford Tractor & Equipment Co., 500 E. 4th St., Reno, Nev.; North Jersey Equipment Co., Inc., 343 Elizabeth, Newark, N. J.; R. L. Harrison Co., Albuquerque, N. Mex.; Mitchell Distributing Co., 733 W. Hargett St., Raleigh, N. C.; Andrews Machinery,

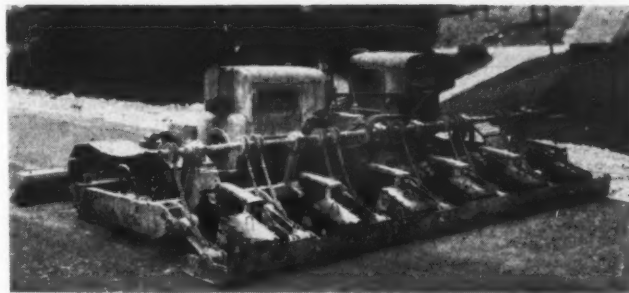
N. W. Broadway and Flanders, Portland 9, Oreg.; Industrial Equipment Co., Inc., P. O. Drawer 750, Sumter, S. C.; Hi-Way Equipment Co., Inc., 953 McCarty, Houston 15, Texas; Northern Commercial Co., Seattle, Wash.; Tri-State Equipment Co., Box 1810, Spokane, Wash.; Contractors Equipment Sales & Service Corp., Honolulu, T. H.; H. A. Bloeser Co., Prudential Bldg., Buffalo 2, N. Y.; McIlhenny Equipment Co., Inc., P. O. Box 1186, Roanoke, Va.; and Matt A. Doetsch Machinery Co., 508 Central Bldg., Washington, D. C.

Solvay Appointments

The appointment of three Assistant Branch Managers has been announced by the Solvay Sales Div., Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y., maker of calcium chloride and alkali products. A. B. Kennedy will assume the newly established post at Detroit; K. M. Dillabough goes to Philadelphia; and J. H. Kaiser will be stationed at Syracuse.

ANNOUNCING

New International VIBRO-TAMPER

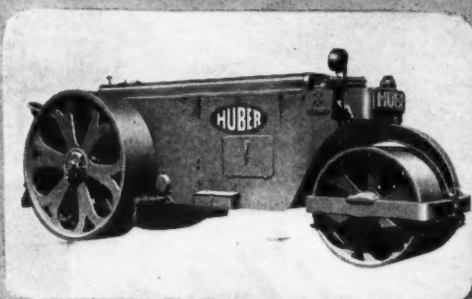


Machine is self-propelled on crawler tracks. Weighs 6600 pounds. Travels from 8 to 88 feet per minute. Best vibration speed 28 to 30 feet per minute but this may vary with local conditions. Vibration vertical to road surface through six-vibrating shoes—

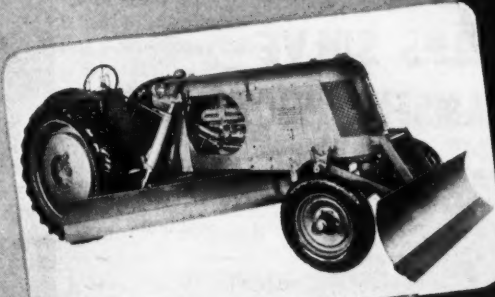
16 inches long, 24 inches wide and weighing 285 pounds. Shoes are in line at front of machine giving it a width of 12 feet. Total unbalance of the weights in each shoe is 16.0 pound-inches.

THE INTERNATIONAL VIBRATION COMPANY, 16700 Waterloo Road, Cleveland 16, Ohio

PIN THIS TO YOUR FUTURE SHOPPING LIST . . .



HUBER 1-WHEEL ROAD-ROLLERS
Automotive type, built in sizes from 5 to 12 tons.

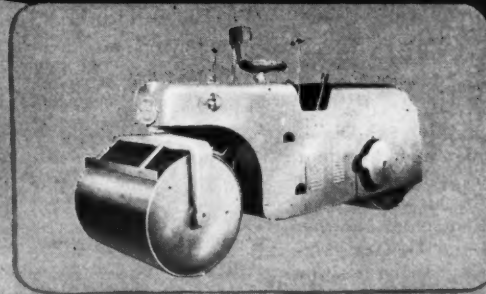


HUBER MAINTAINER
A versatile machine that also serves as a bulldozer, lift-loader, patch roller, snow-plow or rotary broom.



HUBER'S "ONE-MAN GANG"

Do you need a light machine that is as versatile as a one-man-band—but far more useful . . . a maintainer that is a "jack of all trades"—and master of them all . . . then the HUBER ROAD MAINTAINER is the very machine for you. When not working as a scraper or bulldozer, it will: make the snow fly—brush the streets clean—do a good job of patch rolling—or serve as a load-lifter. Have your Huber Distributor put it through its "paces" for you. He will be glad to do it.

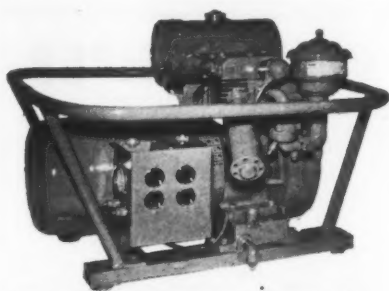


HUBER TANDEM ROLLERS
Variable weight, built in sizes from 3 to 12 tons.

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

HUBER

3 Wheel • Tandem
ROAD ROLLERS
and
MAINTAINERS



The new Kato 600 and 1,000-watt electric plant is for use with all types of ac appliances. It has a specially built handle which permits two or more persons to pick it up and carry it.

New Electric Plant

A new 600 and 1,000-watt electric plant has been announced by the Kato Engineering Co., Mankato, Minn. It is designed for use with all types of ac tools and appliances. Feature of the new unit is a specially built handle which permits two or more persons to pick it up and carry it.

The new Kato plant is furnished with four female outlets. Rope cranking is standard, but it can be made self-cranking by the use of two 6-volt automobile-type batteries. It is powered by a Briggs & Stratton 4-cycle gasoline engine. The generator is said to give close voltage regulation between partial load and full load.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 50.

Waterproofing Agent

A chemical compound said to prevent the seepage of moisture through concrete, brick, mortar, or other building materials, has been put on the market by the Haynes Products Co., 4007 Farnam St., Omaha 3, Nebr. It is claimed that Formula No. 640 will be effective even when the protected parts are subjected to a hydrostatic head.

The solution is a clear, transparent liquid made up of special compounds dissolved in a hydrocarbon base. When it is placed upon a porous surface, the solution is pulled into the pores by capillary action. Upon evaporation, a hard mass is left in the voids. It is this mass, filling the voids, which is said to prevent the passage of water and render the surface resistant to moisture of all kinds. Application can be made by spray, brush, or by squeegee or mop.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 5.

Lima-Hamilton Corp. Formed

The Lima Locomotive Works, Inc., and the General Machinery Corp. have merged to form the Lima-Hamilton Corp., Lima, Ohio. The action will give the corporation a diversified line, including Lima power shovels, cranes, draglines, and pull-shovels, as well as diesel and steam-powered locomotives, marine diesel engines, machine tools, etc.

Samuel G. Allen and John S. Dixon, former Board Chairman and President, respectively, of Lima will occupy the same positions in the new organization. George A. Rentschler, former Board Chairman of the General Machinery Corp., will assume the position of Chairman of the Executive Committee. In the Lima Shovel & Crane Division, Henry Barnhart will continue as Vice President in Charge. Paul R. Ehrigott is General Sales Manager, and H. H. Buchanan is Director of Foreign Operations.

Caterpillar Representative

John G. Findeisen has been appointed District Representative by the Caterpillar Tractor Co., Peoria. Mr. Findeisen, with Caterpillar since 1936, will serve the Florida and Georgia territory.

Concrete Form Accessories

A 24-page catalog describing its line of accessories for concrete form work has been prepared by the Dayton Sure Grip & Shore Co., Miamisburg, Ohio. It covers a complete line of form ties and related pieces of equipment, ranging from those for dams, bridge piers, abutments, and heavy construction of all types, to those for buildings.

The catalog shows how to apply and strip the Dayton Snap-In form tie. Equipment it describes includes wood and metal cone ties, Snapflush ties, tie wedges, riser supports and riser ties, channel ties, ties for architectural concrete, ties for forming curved walls and round tanks, rod ties, and others. Several pages are devoted to hangers and spreaders, anchors, inserts, wall plugs, and spacer, grader, and spandrel-beam ties. A pressure chart is given for estimating lumber stresses and tie spacing.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 80.



**REALLY TOUGH!
AND ABUSE MAKES IT TOUGHER!**

MANGANAL

(Trade Mark Reg. U.S. Pat. Off.)

**11% to 13 1/2% MANGANESE NICKEL STEEL
HOT ROLLED PLATES**

They're back again—MANGANAL HOT ROLLED PLATES to rescue worn equipment from the scrap pile! Patches power shovel buckets, drag lines, etc. Ideal for fabricating new parts. Work hardens under impact and abrasion. Can be rolled and bent hot or cold. Easy to weld with Manganal Bare, or Tite-Kote Welding Electrodes.

Bucket rebuilt like new. Manganal Plates 3/4" thick on lip, 1" thick on heel.

NAME OF NEAREST DISTRIBUTOR UPON REQUEST

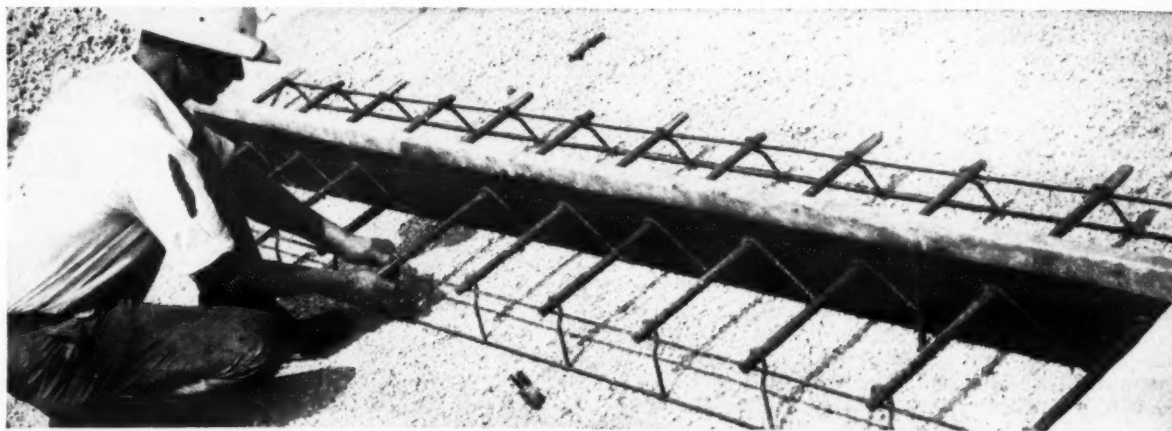
FREE FOR THE ASKING! Our Booklet "The Welding of 11% to 14% Manganal Steel."

STULZ-SICKLES CO.

Sole Producers

91 N. J. Railroad Avenue,

NEWARK 5, N.J.



Installing dowel tubes on Bethlehem Road Joint. These tubes, locked into place on free ends of dowels, provide positive clearance for dowel movement when expansion of the concrete takes place.

New Road Joint HELPS SOLVE LOAD-TRANSFER PROBLEMS

Here it is—the new time-saving Bethlehem Road Joint—a lightweight bar-dowel unit that is specially designed to reduce to a minimum the load-transfer problems caused by heavy wheel loads.

Consisting of two identical units, each with sheared dowels rigidly welded to the side frame and center wire, the Bethlehem Road Joint combats load-transfer difficulties by holding the dowels in accurate alignment in both horizontal and vertical planes, at the same time permitting free movement of dowels in the concrete.

The Bethlehem Road Joint saves time for highway contractors, too, because it comes completely fabricated. Moreover, it is light enough to be handled by two men.

The joint nests conveniently, making it economical to ship by rail or truck. It lends itself to the various designs and specifications of state highway departments, and can be used either plain or with practically any type of expansion or contraction material.

For complete information about the new Bethlehem Road Joint and its applications in highways or airport runways, get in touch with the nearest Bethlehem district office. Or write us at Bethlehem, Pa.

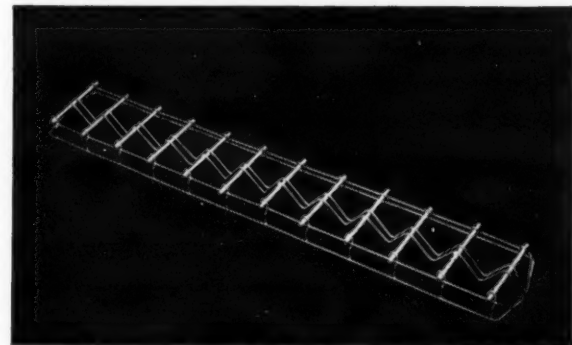
BETHELEHEM STEEL COMPANY, BETHELEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

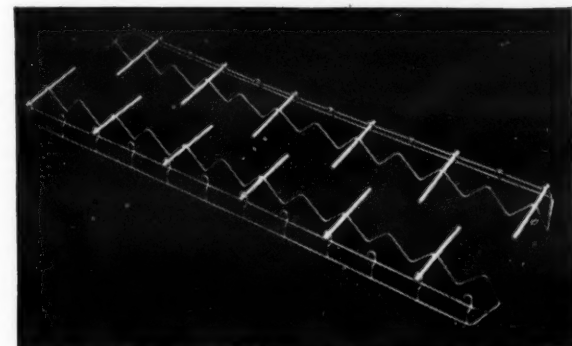
Export Distributor: Bethlehem Steel Export Corporation

STEEL FOR HIGHWAYS

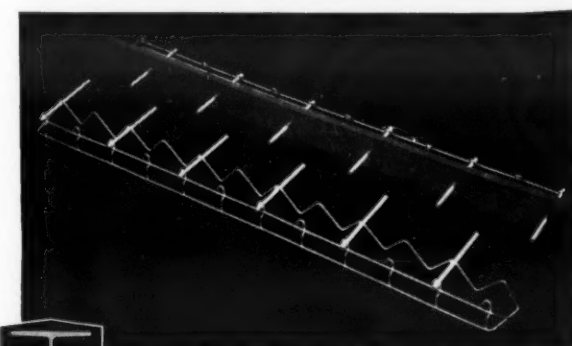
Reinforcing Bars	Bar Mats	Guard Rail	Road Joints
Tie Rods		Guard Rail Posts and Brackets	
Wire Rope and Strand		Spikes	Hollow Drill Steel
Fabricated Structural Steel			Bolts and Nuts
Sheet and H-Piling		Timber Bridge Hardware	



Bethlehem Road Joint comes completely assembled, ready for installation. Note how ends of dowels occupy loops in side frames.



If desired, joint can be quickly separated into these two identical sections to accommodate expansion or contraction material.



Here joint filler, mounted on dowels, is pushed back to center wire. Unit is now ready for reassembly.



Book on Materials Used in Engineering

A textbook on materials of engineering, revised to cover many new construction materials developed during the war and new methods for processing them, has been published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. This is the seventh edition of "Textbook of the Materials of Engineering" written by Herbert F. Moore, Research Professor of Engineering, Emeritus, Engineering Experiment Station, University of Illinois.

The book places primary emphasis on the strength, toughness, and stiffness of stress-carrying materials. It discusses the crystalline structure of metals and the structure of wood, concrete, and plastics. Additional data on plastics, synthetic rubber, and testing machines and methods have been included, and the number of problems and illustrations has been increased.

The chapter on concrete was written by Harrison F. Gonnerman, Manager of the Research Laboratory of the Portland Cement Association; the chapter on crystalline structure of metals was written by Jasper O. Draffin of the University of Illinois; and the chapter on plastics was written by Professor W. N. Findley, also of the University of Illinois. The book sells for \$5.00 a copy.

Construction Toys "Just Like Daddy's"

A line of toys made to look and function just like daddy's construction equipment (only miniature, of course, and roughly around 0.00 mechanical horsepower) is made by Tech-Art, Inc., Milford 8, Ohio. The Sturdybird line includes a crane, and a crane with an electro-magnetic hoist. The crane is furnished with a clamshell bucket; the boom hoists and lowers; the cab swivels to any position. The unit has wide-mouthed rubber treads, and is made with welded-steel construction. It is 31 inches long. The Sturdybird electro-magnetic hoist has a battery-powered magnet said to lift a 10-pound load.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 33.

Steel Dump Bodies, Hoists

A line of steel dump bodies and hydraulic hoists is described in literature obtainable from The Daybrook Hydraulic Corp., Bowling Green, Ohio. One folder covers the A Series Daybrook steel bodies and the Models 6DL and 7DL Speedlift hydraulic hoists for 1½-ton truck chassis. Another tells of semi-trailer dump bodies and the trailer twin and triple tandem hydraulic hoists. A third tells of hoists and bodies designed for all types of heavy-duty hauling on 2 to 10-ton truck chassis. A fourth describes low-mount hoists for wood or steel platform installations.

These folders describe in detail the various units, and show features of construction. They also recommend the proper hoist for various material-handling problems.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 93.

Catalog Describes Jacks

A line of lifting jacks for many purposes is described in a folder put out by The Duff-Norton Mfg. Co., Box 1889, Pittsburgh 30, Pa. These vary in lifting capacity from 5 to 100 tons. Special-purpose jacks listed in Folder No. 203-A include pipe-forcing jacks, trench braces, push and pull jacks, and pinion pullers.

The folder shows photographs of the various jacks and lists model numbers and specifications, recommended uses,

and capacities. The jacks it lists include automatic lowering jacks, 4-way automatic lowering jacks, geared automatic lowering jacks, cable-reel jacks, pole-pulling jacks, Barrett track jacks, surfacing and lining jacks, general-purpose screw jacks, traversing screw jacks, bridge jacks, journal jacks, ball-bearing jack screws, low-height screw jacks, heavy-duty screw jacks, governor-controlled jacks, speed-controlled jacks, air-motor jacks, mine-roof and timbering jacks and fittings, Hy-Power hydraulic jacks, and motor attachments for converting manually operated jacks.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 86.

Unit Moves Houses On Relocation Sites

One of the problems encountered in the vast highway-relocation and airport-expansion plans now being made, is what to do with houses on the proposed site. Because of the time element involved, weather conditions, and the extreme housing shortages, many of these houses will have to be moved intact. To help contractors solve this problem, R. G. LeTourneau, Inc., Longview, Texas, has brought out a big housemoving rig. Known as the Tournamover, it will handle houses up to 25 feet in width.

Electrically operated, it is designed to pick up a house and carry it away, without the need for raising or lowering by jacking or blocking.

Motive power for the Tournamover is supplied by the Tournapull prime mover. Power for raising the frame is furnished by an electric motor which receives its current from a generator mounted in line with the Tournapull engine. This motor is mounted on the U-shaped hauling frame and activates three cable hoists which operate simultaneously. Suspension cables from the three hoists are fastened to the Tournamover carrying frame by specially designed sheave blocks. Coupling is accomplished by the use of three pins.

Synchronized with the master hoists are three independent hoists that can lift from each point separately. These enable the house to be kept level, during transport, even when road grades are encountered. Large pneumatic tires having a large ground-contact area are said to produce only relatively small bearing pressures per square foot. They



The electrically operated Tournamover is designed to pick up a house as wide as 25 feet and carry it away, without any jacking or blocking. LeTourneau developed it to help solve the house-moving problems encountered in highway relocation and airport expansion. The Tournapull prime mover supplies motive power.

also cushion the load against shocks.

Further information may be secured

from the company, or by using the enclosed Request Card. Circle No. 42.

GALION

Adds a New TANDEM

3-5 TON

A SMALL ROLLER WITH
A LARGE APPLICATION

A COMPLETE LINE

**3-WHEEL
ROLLERS**

**TANDEM
ROLLERS**

**PORTABLE
ROLLERS**

GALION

1907-1947

GRADERS • ROLLERS

This addition to the Galion line of Rollers will prove to be one of your most useful and profitable pieces of equipment.

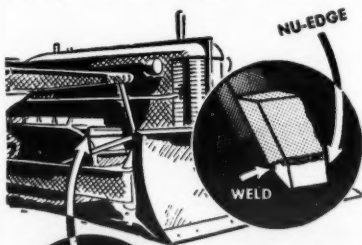
Write for complete information.

THE GALION IRON WORKS & MFG. CO.
General and Export Offices
GALION, OHIO

40
YEARS OF
EXPERIENCE

SAVE \$ and INCREASE TRACTOR POWER

The Bulldozer Blade Nu-Edge Bar is butt-welded to new or worn blade and welding bead covered with a thin layer of hard-surfacing electrode—Affording 2000% savings in blade replacements.



Bulldozer Tractor Grip-Lugs

are easily welded to any size grouser shoe without dismantling assembly. Made of special work-hardening steel which becomes tougher with use—outwearing original grouser.

See Your Local Dealer
Send For Folder CE Today

SOLE PRODUCERS
ALLIED STEEL PRODUCTS, INC.
7835 BROADWAY • CLEVELAND 5, OHIO

Blasts Rip New Road In Mountain Terrain

New Dual-Lane Roadbed Through Mountains Poses Million-Yard Excavation; Variety in 5.54 Miles

♦ A BIG fleet of heavy-grading equipment, with high explosives in a supporting role, played the major part in an important new 5.54-mile grading project on U. S. 99 between Wolf Creek and Glendale Junction, Oreg. McNutt Brothers, contractor from Eugene, Oreg., had the \$850,000 contract with the Oregon State Highway Commission at Salem.

Some 1,100,000 cubic yards of tough digging was involved. It was divided into four sections to get some degree of classification in the bid prices. Otherwise, the McNutt Brothers bid was a straight unclassified estimate to do the work. Nearly half of the total yardage was drilled and shot, however.

McNutt's job brings this section of U. S. 99 to new standards of alignment and grade, and will make this heavily traveled north-south highway much safer in the winding Wolf Creek vicinity. The McNutt contract cleared and grubbed 195 acres of mountain slope, removed the cut sections and shaped the fills, installed necessary drainage, and covered the finished embankment with a 16-inch blanket of selected rock from a summit cut. Two interesting 270-foot bridges for detours were also erected, one of which crossed a highway cut 90 feet above grade.

New Roadbed Design

For 33,645 feet the new roadbed was shaped to a top width of 50 feet, with variable side and backslopes. This will give ample room for a 24-foot two-lane riding surface, to be laid under a subsequent contract, plus shoulders. Through the remainder of the job the roadbed is 59 feet wide to permit a four-lane passing section at the mountain summit.

On the widened section, the embankment was built 27 feet wide on the cut side, and 32 feet wide on the fill. The quantities of earth and rock were nicely balanced to make this construction possible.

Special interceptor drains were placed at the top of some of the wet spots, but they were placed at the bottom of the fills, where ground water is a problem. Other drains carry run-off water through the fills. There are about 3,800 linear feet of special perforated 9-inch-diameter metal drains used as interceptors; they were laid in a trench which was backfilled with selected pervious coarse rock. There are also 3,000 feet of 18-inch concrete-pipe cross drain, 1,240 feet of 24-inch, and 920 feet of 36-inch concrete pipe.

Drainage Is a Problem

Drainage of ground water at the bottom of the fills was, in fact, one of the early problems in the job. The clear-

ing was subtle to a logging subcontractor, who had a market for the fine fir logs on the steep mountainside. But even before this subcontractor had moved in with his saw crews, Superintendent Stanley Quigley of McNutt Brothers was busy getting some of the drains in.

Peculiarly enough, the formations varied a great deal between drains. Heavy blue mud in a 50-foot-deep pocket was found in one spot, and had to be mucked out by a Northwest Model 25 dragline. At the base of the big 164,000-cubic-yard fill just north of the summit cut, Quigley had to use a tractor-drawn LeTourneau K-30 Rooter to shape one of the trenches. In other spots, the trench for pipe was dug by one of five D8-mounted LeTourneau bulldozers on the job. Each drain was its own individual problem.

Before the big 164,000-yard fill was ready to rise from a canyon floor, two reinforced-concrete box culverts were built through its base, and three laterals and one interceptor drain were laid. Though the job was started officially on November 10, 1946, this preliminary work took up practically all the remainder of the winter season, and it was 1947 before the grading equipment could start to work to very good advantage.

Selection of Equipment

McNutt Brothers, one of Oregon's leading highway-grading contractors, chose a big and impressive fleet of



C. & E. M. Photo

A Lima 802 shovel with an Esco rock dipper loads a Tournatrailer deep down in a heavy cut on U. S. 99 in Oregon.

heavy-grading equipment to cope with blue mud, red clay, clay-silt, soft shale, and with solid shale and serpentine rock. The equipment fleet was designed for short and long-haul work under all these varieties of conditions.

There was a new Lima 802 shovel, with an attendant haul fleet of six 10-wheel Ford trucks and three Model W-210 Tournatrailers. It was working on the north end of the summit cut when CONTRACTORS AND ENGINEERS MONTHLY's Western Editor visited the job. Operating as a unit, this separate fleet was busy placing material down in the big fill just north of the cut, with a 1,500-foot one-way haul involved for the Tournatrailers and trucks.

There was a Northwest 80-D shovel with a haul fleet of three LeTourneau rock buggies, built up in the McNutt shop so they would hold 30 cubic yards

instead of the 26 cubic yards for which they were designed. For months this outfit fought solid rock, aided by a blasting and drilling crew. In one 206-foot-deep cut alone were about 400,000 cubic yards of rock excavation. The big buggies had a 1,000-foot one-way haul to a rock fill south of the cut.

Three Super C Tournapulls, with plenty of hours on other McNutt highway work, were brought in for the long clay hauls up to 5,000 feet one way. This outfit generally worked alone, aided by one of the D8 Caterpillar pushers on the job.

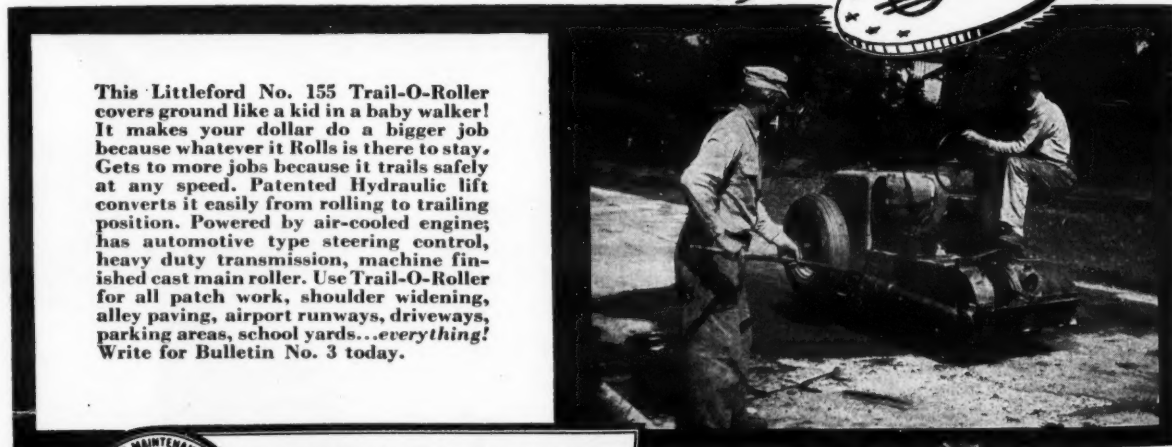
And then, of course, there was—as there must be for rough, rugged preliminary work—a fleet of scrapers. Seven 15-cubic-yard LeTourneau Carryalls, each in-tow by a Caterpillar D8 tractor, were used.

(Continued on next page)

**Make Your Repair Dollar
Cover More Roadway**

**with LITTLEFORD
TRAIL-O-ROLLER**

This Littleford No. 155 Trail-O-Roller covers ground like a kid in a baby walker! It makes your dollar do a bigger job because whatever it Rolls is there to stay. Gets to more jobs because it trails safely at any speed. Patented Hydraulic lift converts it easily from rolling to trailing position. Powered by air-cooled engine; has automotive type steering control, heavy duty transmission, machine finished cast main roller. Use Trail-O-Roller for all patch work, shoulder widening, alley paving, airport runways, driveways, parking areas, school yards...everything! Write for Bulletin No. 3 today.



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LITTLEFORD BROS., Inc.

485 E. PEARL ST.,

CINCINNATI 2, OHIO

CHECK THE REST—BUY THE BEST...

Proven In Performance.....
Passing The Toughest Tests.

Look to La Crosse for a versatile, maneuverable trailer with Engineered Construction that's easy to maintain SO...

Compare The Cost—
Then Look To La Crosse

Dealers In 48 States



LA CROSSE
TRAILER CORPORATION
LA CROSSE, WISCONSIN

Everyone's help is
needed for a sustained
attack on cancer.

Give generously to

**THE AMERICAN CANCER
SOCIETY, INC.**

350 Fifth Ave., New York 1, N.Y.

These four outfits accounted for between 8,000 and 9,000 cubic yards of material each day they worked in force on the job for two 8-hour shifts.

Rock-Excavation Methods

The summit cut, with 400,000 cubic yards of rock, was a battle in its own right. But rock-excavation methods there were typical of others in various parts of the contract. The system included portable compressors, small drills, and numerous blasts.

Two Schramm 315-cfm portable compressors and a 365-cfm Gardner-Denver furnished air to a dozen Thor and Gardner-Denver sinker drills. These hand drills pushed down 20-foot-deep holes, though on a few of the benches shorter steel was used. Timken steel and Timken 2 3/8-inch-diameter detachable bits were used throughout.

Not all the twelve sinkers were constantly in operation, of course, but each machine bored about three 20-foot holes per 8-hour shift. Some of the rock was quite fractured; some was ravelly; some, hard. The drills rattled down through it all, with more difficulty in some formations than in others. But three holes were a fair average, and drillers on the McNutt job regarded that a good day's work.

The holes were spaced on 12-foot centers for almost all formations. Each hole was sprung twice, first by 3 sticks of Pacific 60 per cent special gelatin, then by 14 or 15 sticks of the same powder. As a safety measure, and to boost springing efficiency, a light stemming was placed over the charges. The pocket thus created took from 45 to 50 pounds of Pacific Free Flow 40 per cent bag powder in the dry places. Gelatin had to be used wherever the rock was

waterlogged.

All holes to be shot were fitted with Pacific No. 6 electric blasting caps, with 22 and 24-foot No. 18 copper-wire leads. A hand-blasting set, hooked to the system of wires, exploded the powder charge in a shot. Generally not more than 1,000 pounds of high explosives were shot at one time. When these shots were made, traffic—which amounted to 500 cars an hour during the daytime—was flagged to a stop about 1/2 mile on each side of the blast.

The broken rock was then dipped out by the two shovels, and hauled to respective fills by the haul fleets. A twisting haul road had to be pioneered downhill from the big summit cut to get shovels and haul units up there to begin. The 30-cubic-yard loads in the heavy-duty LeTourneau rock buggies were so ponderous that the D8 operators had to take these loads downhill to the fill in low gear. For a while they tried going down in second gear, but the wear on engines and brakes was excessive. The return trip uphill to the shovel was made in second gear.

Rock from the summit cut was so peculiarly well suited for use as selected topping that the last few feet towards the bottom were shot rather heavily, broken out in small chunks, and used for the 16-inch rock topping blanket on the finished earth embankment. The rock packed down well, it broke up to pea-gravel size under the action of traffic, and could easily be dressed smooth by a motor grader. In fact, detours made with this material were smooth almost from the start, and took an excellent oil surface where pressure distributors were used.

By the time the 200-foot-deep cut neared the bottom, all the rest of the



C. & E. M. Photo

Workmen on the McNutt contract install and backfill an 18-inch concrete-pipe drain under a fill. About 3,000 feet of this size of pipe was used on the job.

embankments were finished. Side slopes in rock sections were cut as steep as 1/2 to 1 in the solid formations.

With at least 75 per cent of the contract on a new location, but all following the same general alignment, earthmoving and hauling equipment frequently had to cross the highway. Flag-

men were stationed at critical points, and the job was full of warning signs.

Dirt-Moving Is Tough, Too

Not all the hard work was connected with rock excavation, tough as that was. Equally difficult was the earth work. (Concluded on next page)

GUARANTEED



When properly used Page AUTOMATIC Buckets will outdig ordinary buckets of comparable size.

That's a guarantee you can easily prove for yourself by a competitive test. Compare the production of your present bucket with that of an AUTOMATIC. Hundreds of dragline operators in all kinds of digging have found that their AUTOMATIC buckets dig more yards at a lower cost per yard than any other dragline bucket they have ever used.

Here's why: Page AUTOMATICS dig right in at the first pull on the load line and get a full pay load within one to three bucket lengths regardless of the depth—20 ft., 100 ft. or more. This means that most of your operations are under or near the end of the boom point where the minimum amount

PAGE ENGINEERING COMPANY
Clearing Post Office • Chicago 30, Illinois

of power is required for hoisting the load. Perfect balance of the AUTOMATIC assures perfect control whether loading or dumping. Quick loading features of AUTOMATIC buckets mean less wear and maintenance on the bucket, cables and the dragline as well as minimum operator fatigue. For more complete details, see your own construction equipment distributor or write for new booklet "How to Get the Most Out of Your Page Automatic Dragline Bucket."

PAGE
DRAGLINE BUCKETS and
WALKING DRAGLINES



The GATKE Brake Survey simplifies selection of GATKE CUSTOM-BILT Brake Blocks and Liners and saves you time. Ask your GATKE Jobber.

Contractors and Fleet Operators profit by the extra performance of GATKE CUSTOM-BILT Brake Blocks.

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Gatke CUSTOM-BILT BRAKE LININGS
BLOCKS SETS ROLLS SHEETS
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228 N. La Salle St., Chicago 1, Ill.

WAGONS AVAILABLE
For IMMEDIATE DELIVERY

5 NEW Mississippi Wagons
(Mfd. by M-R-S)
Ideal for low-cost haulage
Capacity—8 1/2 c.y. struck

AUGUSTINE CONTRACTORS COMPANY
Clearfield & Melvale, Philadelphia 34, Pa.

J. W. Stang Wellpoint System FOR SALE

Consisting of Wellpoint Pump, Jetting Pump with 300' 6" Header Pipe—130 Swing Joints, 125 Wellpoints, 1 1/2" pipe, valves, etc. Almost new. Will sacrifice for quick sale.

Watkins-Aldridge Equipment Co.
Jackson, Mississippi



C. & E. M. Photos

From high above the biggest cut on the McNutt grading job in Oregon (first photo) we see a Gardner-Denver compressor in foreground; a Northwest 80-D shovel loading a LeTourneau rock buggy, center; a Lima 802 loading a Tournatrailer, upper left; and the existing highway at the right. In the second photo, a D8-mounted LeTourneau bulldozer, a Caterpillar-drawn sheepfoot roller, and three D8-drawn Carryalls work on a fill at the north end of the job.

Blasts Rip New Road In Mountain Terrain

(Continued from preceding page)

Tractors and scrapers engaged in working out a thick layer of reddish-brown clay suddenly started to mire to the top of the tracks in sticky blue mud. Quigley had to pull them off and put a Northwest 25 dragline in to get to the bottom of the situation.

Scraper hauls were generally kept down to 1,000 feet one way, because much of the scraper work was on steep grades where long-haul work would not be very productive. The Carryalls were loaded downhill whenever possible. Usually about four or five of the seven Carryalls worked together as a fleet, and one pusher tractor helped them to load and kept the borrow pit smooth.

For the faster long-haul work, the three Super C Tournapulls took over. They too had one pusher tractor assigned to help them pick up their loads.

Processing of the earth fills made by the Super C's and tractor equipment was merely a matter of dumping the material about 12 inches thick, smoothing it up with a bulldozer, and tamping it down with a sheepfoot or pneumatic roller. Two LeTourneau sheepfoot units were used on the job, and also a Bros pneumatic-tire roller behind a John Deere tractor. The rolling on an earth fill was continuous, more or less, and no specified number of passes was required.

Material hauled by the Tournatrailers, Ford trucks, and LeTourneau buggies was processed in lifts up to 3 feet.

Equipment Care

To care properly for an equipment fleet of this size, two special portable lubrication trucks were on the go day and night to fuel, service, and grease all the various units. At each end of the job was a fully equipped repair shop, staffed with good mechanics, spare parts, and tools. Once each 8-hour shift a service truck called at every piece of equipment. All told, there were 69 pieces of heavy equipment that required service.

In order to service the tractors, scrapers, and Tournapulls without interfering excessively with their working time, the two traveling grease trucks worked from 9:30 p. m. to 6 a. m., while the machines were idle. During those hours the two mechanics on each truck could give each machine excellent service. The daytime greasing, at the lunch hour when possible, was usually limited to a quick shot of lubricant to the track rollers, addition of fuel, and a few other similar fast operations.

Fueling of compressors, shovels, and the host of big equipment was a distinct "must", however, and the proper care of equipment had the highest priority on the job. According to Stanley Quigley, either grease truck was more important to the project than even his own pick-up.

Quigley is one of those competent, conscientious, hard-working superin-

tendents who believes in staying out on the job as long as his equipment is working. That made his day about 16

hours long, many times, at Wolf Creek. He planned to have the contract pretty well wound up by October 1, 1947.

Personnel

This project was designed and administered under the supervision of R. H. Baldock, State Highway Engineer of Oregon; H. G. Smith, Construction Engineer; and K. D. Lytle, Division Engineer. Glenn E. Roberts was Resident Engineer on the job.

Caterpillar Expands Plant

Construction of a new factory addition to its Peoria, Ill., plant has been started by the Caterpillar Tractor Co. It will house facilities for the manufacture of diesel wheel-type tractors and diesel motor graders, and for the assembly of scrapers, wagons, and rippers.

The architects and engineers are Giffels & Vallet, Inc., and L. Rossetti of Detroit, Mich. Pile-driving work is being done by Raymond Concrete Pile Co., 140 Cedar St., New York City.

TORCH-HEAT UNIT

MAKES BIG FURNACE HEAT VOLUME AVAILABLE ON ANY JOB—ANYWHERE



DE-ICING EQUIPMENT



TRENCH THAWING



CULVERT THAWING



SPRAYING WEED KILLERS



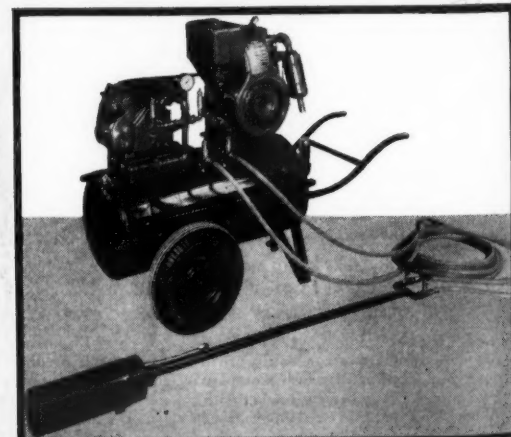
GREEN BRUSH DISPOSAL

Fire and Temperature to melt steel — 25% more volume than your Asphalt Booster; or smaller fire to match any requirement.

VERSATILE—Summer, Winter, Fall and Spring —Utility limited only by ingenuity of the man on the job.

HEAT AND FIRE FOR—Asphalt patching; Frost boil repair; OA-30 Underseal; Green brush, weed and stump disposal; Weed control; Paint removal; Protective heat on building construction.

THAWING, DE-FROSTING, DE-ICING—Equipment; Ground for excavating, trenching; Coal, oil or aggregate in cars; Clearing lines, pumps and other asphalt handling equipment; Culverts, frogs and switches.



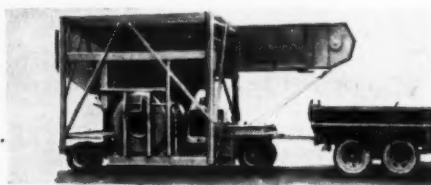
Instant, time saving results on any job where heat is the one positive answer.

Pressure Atomization Type Oil Burner. Burns No. 3 fuel. No generator Coil. No waiting. Full manual modulation—4 to 24 gallons per hour. Eighty Horsepower at nozzle—2600° to 2700°.

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**30* CU. YD-HR
PORTABLE
CONCRETE PLANT**

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STRAYER Portable CONCRETE PLANTS

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BUCKETS • AGGREGATORS • PORTABLE CONCRETE PLANTS

CAPACITY OF PLANT

Up to 30 cu. yd./hr depending on mixing time.

CAPACITY OF MIXER

Full 3/4 cu. yd. with 10% surcharge capacity.

CAPACITY OF BIN

20 Cu. Yd. heaped 3 equal compartments.

CAPACITY OF AGGREGATOR

Full 3/4 cu. yd. with suspension type scale.

CAPACITY OF ELEVATOR

60 Tons/HR handling material weighing 100 lbs. per cu. ft.

OPERATING CONTROLS

All Mixer Bin and AggreMeter Gates hydraulically operated with control levers banked at operator's position.

* 40 Cu. Yd./HR Plant also available.

Highway Labor Costs High; Equal One-Third of Total

Wages paid to labor by contractors accounted for close to one-third of the total cost of building Federal-Aid highways during the second quarter of 1947. This was pointed out recently by Charles M. Upham, Engineer-Director of the American Road Builders' Association. The labor charge does not include pay of workers in mines, quarries, factories, and other sources of material and equipment.

Hourly wage rates for highway labor vary greatly throughout the nine Public Roads Administration geographic

divisions of the United States. The national average is \$1.59 per hour for executive, administrative, and supervisory jobs; \$1.68 for skilled labor; \$1.22 for intermediate-grade labor; and 89 cents for unskilled labor.

Lowest wages were paid in the South Atlantic, East South Central, and West South Central Divisions. The highest wages were paid on the Pacific Coast, where boss jobs drew \$2.20 per hour; skilled labor, \$1.96; intermediate, \$1.54; and common labor, \$1.29. In the New England Division, men in supervisory capacities drew only 31 cents an hour more than the unskilled laborer. In only two of the nine divisions, the

Mountain and Pacific, did the executive-administrative-supervisor class receive more than skilled labor; and in the Mountain Division, this advantage was only 3 cents an hour.

Data on Tractor Tires

A catalog on its line of tires for use with wheel tractors can be obtained from the Seiberling Rubber Co., Akron, Ohio. This 20-page catalog contains a description of the Plow Contour tread which features deep, curved, arrow-head lugs.

The catalog also describes the internal construction of the Seiberling tires,

and tells how it works to the advantage of tire users. The final page is devoted to the tire and tube sizes available.

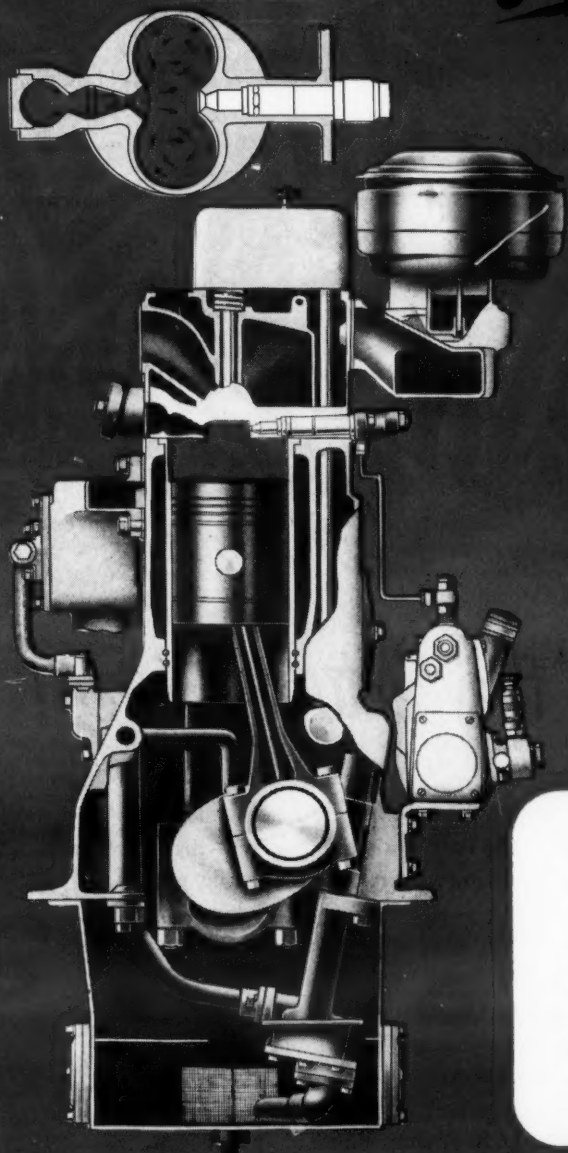
Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 96.

New Dravo-Doyle Office

The Dravo-Doyle Co. of Pittsburgh has announced the opening of a Cleveland, Ohio, branch office for supplying construction equipment to contractors in that area. Located at 3400 Independence Road, it has space for indoor and outdoor storage of equipment which the firm will rent or sell.

SERVICE

*for the engines that
Experience built...*



The responsibility of The Buda Company to the ultimate user does not end with the design, manufacture and shipment of powerful, economical, dependable engines, power units and generator sets for every industry. Since the first BUDA engine was built in 1910, it has been our constant policy to keep BUDA power always on its toes, delivering more horsepower hours per dollar. That is why factory-trained maintenance men have been placed near you... in your BUDA Distributor's office. These men are part of every BUDA engine you buy, so take advantage of their capable service.

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Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Government's Liability

For Delay: Final Verdict

THE PROBLEM: Exactly what is the Government's liability for delaying a contractor? In other words, what is the court's interpretation of Article 9 of the current standard contract for Government construction jobs?

THE ANSWER: The Supreme Court interpreted the article on November 25, 1946. (United States v. Howard P. Foley Co., 67 Sup. Ct. 154.) By a vote of six to three—with Justices Black and Jackson on opposite sides, as is common if not usual—the Court held:

The Government is not liable for delaying a contractor through failing to furnish promptly a completed base for his work (1) where the contract does not contain a warranty that the base will be so furnished promptly, and (2) where delay in furnishing it results from unforeseen causes. The highest court of the land thereby reversed a decision of the United States Court of Claims (63 Fed. Supp. 209, 215).

The Court of Claims has consistently taken the view that Article 9 is not so worded as to exclude liability of the Government for damages for delaying a contractor. The majority opinion of the Supreme Court, on the other hand, interprets Article 9 as relieving a contractor from the penalty of contract termination and liquidated damages for delayed performance due to "acts of Government" and "unforeseeable causes". But it does not make the Government liable to him.

Article 9 deals primarily with the rights of the Government, by specifying what it may do when the contractor is in default. Rights of the contractor are dealt with in a proviso to this effect: that a contract shall not be terminated, and the contractor shall not be subjected to liquidated damages, for delays due to unforeseeable causes, including among others specified, "acts of government"—if the contractor notifies the contracting officer, who must extend the time for performance if that be justified, etc.

Bowing to the decision of the Supreme Court already cited, the United States Court of Claims, against its own views, has decided that the Government could not be held liable for delaying a contractor through delay in furnishing units to be installed. (J. J. Kelly Co. v. United States, 69 Fed. Supp. 117.) The Court of Claims adds:

"We respectfully suggest, however, in view of this final settlement as to the proper construction of Article 9 which is included in most of the current construction contracts, that those who represent the different agencies of the Government, if they are wise, would consider modifying the form of Article 9 in future contracts so as to make it clear that the contractor will be entitled to recover any damages that might be due to any affirmative wrongful act on the part of the representatives of the Government or any

positive neglect on their part which may cause delay and additional costs to the contractor."

Thus we see once more that we can never be sure what a contract means until that meaning has been declared by a majority of the judges of the court that has the last "crack" at the question.

"Construction Ahead" Sign Ineffectual, Court Rules

THE PROBLEM: A sign reading "Construction Ahead" was set up to warn motorists of an open trench alongside a paved road about to be widened. The sign was approximately 4 x 4 feet in size and 2 miles away from the trench. Around it were advertising and highway directional signs. In an accident that took place, was the motorist sufficiently warned of the trench?

(Concluded on next page)

HOT or COLD Mix Asphalt

DUST
COLLECTORS
AIR WASHERS
ASPHALT
TANKS
OIL TANKS
PUMPS



FEEDERS
DRYERS
MIXERS
BOILERS
OIL BURNERS

DEPENDABLE

THE SIMPLICITY SYSTEM COMPANY
CHATTANOOGA, TENNESSEE, U.S.A.



For once they actually agree!



Hope and Crosby, in the movies, seldom see eye to eye.

But there's one thing they really do agree on—they both think U. S. Savings Bonds make wonderful Christmas gifts!

SAYS BOB: "They're swell for *anybody* on your list. You couldn't pick a nicer, more sensible, more welcome present. Even Crosby knows that."

SAYS BING: "I hate to admit it, folks, but Hope is right. And remember this—you can buy Bonds at any bank or post office in the U. S. A."

BOB AND BING (together): "This Christmas, why not give the finest gift of all—U. S. Savings Bonds!"

Give the finest gift of all ... U.S. SAVINGS BONDS

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EIGHT SIZES

Up to 1000 Tons per day

DRYERS

Two-Fire and Internal
Fire

30 to 100 Tons per hour

Electric Batch Timers

50 Years' Experience

THE F. D. CUMMER & SON CO.

EAST 17th & EUCLID
CLEVELAND 15, OHIO

Avoid Legal Pitfalls

(Continued from preceding page)

THE ANSWER: No, decided the New York Court of Claims in the case of Petrozak v. State, 69 N. Y. Supp. 2d, 809.

The court said that, lacking further warning, the motorist had "no notice of just what to guard against. Even if a driver did see the sign, he would then proceed for more than 1½ miles without observing any unusual or dangerous condition, or any active construction work, and, under such circumstances, would scarcely anticipate the sudden appearance of a dangerous open trench along the side of the pavement."

The opinion adds that the fact that the trench might have been plainly visible on a clear day did not show that the injured motorist was negligent. For the accident occurred during a rain when visibility was impaired even with windshield wipers working.

Delays in Furnishing

A Construction Site

THE PROBLEM: A subcontract on a dam-construction job specified that neither the owner nor the general contractor should be liable to the subcontractor for delay in securing title to, and possession of, the site. How far did this excuse the contractor from liability to the subcontractor for delay in furnishing him the site?

THE ANSWER: The contractor was not liable if there was no negligent delay in attempting to secure title and possession, and if he acted in good faith. (Sammons-Robertson Co. v. Massman Construction Co., 156 Fed. 2d 53, decided by the United States Circuit Court of Appeals, Tenth Circuit, and affirming a decision of the United States District Court, Northern District of Oklahoma.)

This is to be remembered, however: that unless there is a clause in a contract excusing delay in furnishing the site, the owner (as between him and the general contractor) and the contractor (as between him and a subcontractor) are under unqualified obligation to furnish the site in such time as to avoid delaying the other party. (17 Corpus Juris Secundum, 1075, sec. 505.)

City Taxes a Contractor Doing Business Elsewhere

THE PROBLEM: Was a general contractor subject to a license tax in a South Carolina city where he lived and maintained his general office, although none of his construction work was performed there?

THE ANSWER: Yes, said the South Carolina Supreme Court. (40 S. E. 2d, 684.) There was a statute permitting imposition of license taxes upon anyone engaged in "any calling, business, occupation, or profession, in whole or in part, within the limits" of cities and towns.

The court ruled that a contractor must be deemed to be engaged in business, in part, in a city where he maintains an office, where the executive and administrative phases of his business are conducted, and where his equipment is stored in the city when not in use. The court approvingly quoted a declaration by the Georgia courts in a similar case, where a paving contractor was held to be subject to a license tax:

"What is done at the general office or general headquarters cannot be said to be a mere incident of a business in which the proprietor is engaged. It is a substantial and necessary portion of the composite undertaking, and is not a distinct element or part. . . . Whether a business like the plaintiff's might have more than one taxable location or situs, and whether or not the situs is the controlling factor in the sense that an occupation


tax could not be levied elsewhere, are questions which are not involved in the case at bar, because . . . the principal situs here was in the city" where the tax under consideration was levied.

The opinion of the South Carolina court cites decisions supporting the statement: "The right of a municipal corporation to impose a tax of this kind upon a corporation or business conducted within the city limits,

although a portion of the business is carried on or the transaction is factually completed outside such municipality, is generally recognized. . . .


"We find no reasonable justification for a construction of this ordinance which would make the liability for the payment of a license contingent upon all of the functions of the taxpayer's business being performed within the city. . . . It was not contemplated

that the various phases of a business should be segregated and only that part taxed which was actually carried on within the corporate limits. The tax was imposed for the privilege of maintaining and conducting a place of business within the municipality, and it was intended that the business should be considered as a whole. The gross income or volume of such business is merely made the basis on which the tax is graduated."



A MOUTHFUL at EVERY BITE

This is not only the claim of OWEN, the name symbolic of the highest grade Excavating and Handling Buckets for years. — Operators everywhere, "on and off" the job, volunteer this testimony.



And — there's a reason. Owen-engineered buckets incorporate special features which have been continually improved.

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American Road Builders' Association

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TWO IMPORTANT MEETINGS IN 1948

HIGHWAY CONFERENCE

JANUARY 26-28

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WASHINGTON, D. C.

An interesting 3-day program! Famous speakers, conferences, forums, reports of technical committees, business sessions, induction of new officers. The capital at the height of the season!



Make your hotel reservations AT ONCE! Congress will be in session at the time. Write, wire or phone for official application blanks today.

1948 ROAD SHOW

SOLDIER FIELD

and

45th Annual ARBA Convention

JULY 16-24

CHICAGO

The 1948 ROAD SHOW will be the largest exposition of equipment, machinery and materials used in the construction of highways and airports ever staged . . . for the first time, heavy machinery exhibited AND OPERATED out of doors in an area of over 1,200,000 square feet. 100,000 people will see it.



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PROTECT YOUR HOME FROM
TUBERCULOSIS

Buy Christmas Deals



A Hystaway mounted on a Caterpillar D7 changes a creek bed in order to prevent a bridge from washing out near Lawrence, Kansas.

Salt's Effect on Concrete Discussed by Ice Bureau

Can rock salt be used safely on concrete streets and highways for snow and ice removal? This question has been answered in the affirmative by the Ice Removal Bureau, 122 E. 42nd St., New York 17, N. Y.

The matter is summed up in a report by B. R. Downey, Maintenance Engineer, Michigan State Highway Department: "A comprehensive study of this problem has been made by our Research Division, and their reports in the matter indicate that proper or recommended quantities of chloride salts can be used safely on concrete pavements which have reached an age of 5 years or more, or on concrete pavements, regardless of age, which have been constructed with air-entraining cement."

This is corroborated by the Portland Cement Association which reports, in part, in Bulletin HB-1 that "field observations indicate that concrete several years old is 'unaffected or much less affected by sodium chloride' than is new concrete. The Association states that the greater resistance is due to undermined causes, but probably results from the sealing effects of oil drippings, dust, etc. It also reports that concrete with excellent resistance to frost action and immunity to salt applications can be produced with air-entraining portland cement.

The Asphalt Institute is quoted by

the Ice Removal Bureau as saying that rock salt "has absolutely no effect whatever on asphalt construction".

Pumping Action of Slabs: Its Prevention and Cure

Maintenance methods for preventing and correcting the pumping action of concrete pavement slabs is the subject of the newest bulletin released in the Current Road Problems Series. These bulletins are issued by the Highway Research Board. Their purpose is to disseminate the best available current information on those phases of highway work that are still developing.

The booklet includes developments in the use of bituminous materials as a medium for jacking or filling voids under slabs—developments which have occurred since publication of the original booklet on the subject. Bulletin No. 4-R, completely revised, makes available information on current practices in the use of these bituminous materials; it also gives data on mixtures of soils and other materials for slurries used in Mud-Jacking.

Booklet 4-R goes all through the subject, from the definition and causes of pumping to maintenance practices set up by state highway departments. All phases of the work and materials used are thoroughly described and explained.

Copies can be obtained by writing to the Board at 2101 Constitution Ave., Washington 25, D. C. Cost of the booklets is 25 cents per copy.

N. Y. Engineers Name Meyer

William H. Meyer, Jr., has been named Director of the Photogrammetric Division recently organized by Lockwood, Kessler & Bartlett, Inc., Engineers, surveying firm of Brooklyn, N. Y. Mr. Meyer has been associated with Fairchild Aerial Surveys, Inc., New York, and with the Aero Service Corp., Philadelphia.

Tournalayer Sales Office

The Tournalayer Sales Division of R. G. LeTourneau, Inc., has announced the opening of a division office at 5007 E. Washington Blvd., Los Angeles, Calif. The Division is a distinct sales unit of LeTourneau, with the direct commission of handling such equipment as the Tournalayer, Tournamixer, Tournacran and Tournahauler.

Bin-Level Indicator

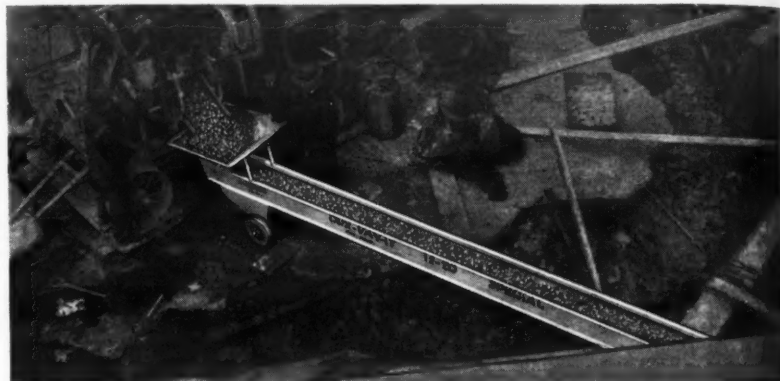
An indicator for showing the level of materials stored in bins is made by The Bin-Dicator Co., 14615 E. Jefferson Ave., Detroit 15, Mich. Catalogs and engineers' drawings which give directions for installation and arrangement have been prepared and are available for distribution upon request to the company.

The catalog lists some of the more than 100 materials with which the company says the indicators will work. It gives explanatory notes to cover all phases of installation and operation; it

shows a typical installation, and gives a list of specifications.

The drawings cover the Models A and C Bin-Dicators; the automatic bin-level control; the Type L adapter for curved surfaces; a wiring diagram for automatic control of a conveyor feeding a series of hoppers—in which the conveyor starts when any of the hoppers approach an empty condition and stops when all are full; and the explosion-proof and general-purpose micro switches.

Copies of this literature may be obtained from the company. Or use the enclosed Request Card. Circle No. 60.



CONSTRUCTION COSTS DROP and PROFITS RISE with CON-VAY-IT Special

Builders employing this revolutionary new Concrete Conveyor are saving as much as 80c on every \$1.00 formerly spent on labor, in the pouring of concrete. It also conveys bricks, blocks, dry aggregate, and many other building materials; helps with the loading and unloading of trucks, and removal of excavating materials from under buildings. You should know about CON-VAY-IT Special — write for information TODAY.

AMERICAN CONVEYOR CO.

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RAINCAP

STOPS MOISTURE FROM FALLING INTO TRACTOR EXHAUST
... Just slip the "RAINCAP" over the open end of your tractor exhaust, and you eliminate forever the danger of moisture falling into the exhaust, injuring your tractor.

THE CAP THAT DOES NOT FORGET TO CLOSE... Completely automatic—the "RAINCAP" is counter-balanced to open when the tractor starts and close when it stops. Rust proof—made of cast aluminum—can be installed in two minutes. F.O.B. Waterloo, Iowa.

Immediate delivery
Liberal dealer discount

No.	O.D. Exhaust	Price
1	2 1/8"	\$1.90
2	2 3/8"	1.90
3	2 3/4"	1.90
5	1 7/8"	1.90
55	2"	1.90
6	1 1/2"	1.90
66	1 3/8"	1.90
7	2 1/2"	1.90
8	3"	2.50
9	3 3/8"	2.50
10	3 1/4"	2.50
11	3 1/2"	2.75
12	4"	3.00

Write Dept. C-1

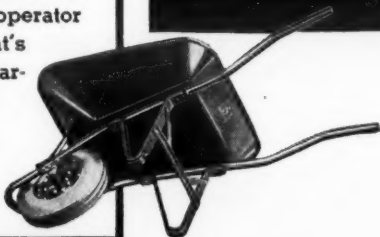
WATERLOO FOUNDRY CO., WATERLOO, IOWA



Sterling barrows wheel so easily, they make it seem like going down hill all the way. Lightweight... well-balanced... equipped with modern, anti-friction bearings. Sterlings relieve the operator of fully 80% of the load. That's why they are the preferred barrow in all types of industries.

The demand for Sterlings continues to exceed the supply. Deliveries, however, will be stepped up as rapidly as conditions permit.

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Balanced
FOR
EASY WHEELING!**



STERLING WHEELBARROW CO., Milwaukee 14, Wis.

Sterling
WHEELBARROWS



Look for this Mark of
STERLING Quality

Fuel-System Cleaner

A liquid fuel-system cleaner designed to dissolve and eliminate formations of gums, tars, and other binders has been announced by the Celco Corp., 110 E. 42nd St., New York 17, N. Y. Tank Kleen No. 101 is said to work by re-forming all soluble hydrocarbon binders into a liquid which burns with the fuel. At the same time, it renders free all insolubles into a colloidal suspension. The manufacturer states that it can be used with any fuel system—oil, gasoline, kerosene, or fuel oil—simply by pouring it directly into the fuel tank.

Features claimed for Formula No. 101 are: it eliminates condensation and starts from the fuel system, prevents freezing of lines during winter, improves starting in summer and winter, cleans sticky valves and dirty carburetors without their removal.

Celco also makes Formula No. 109, a concentrated sludge solvent for oil in the crankcase; and Celco-Lene No. 105,

an upper-cylinder lubricant to be added to the fuel to improve carburetion.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 24.

Blaw-Knox Sales Engineer

The appointment of Cornelius L. Sarosdy as Sales Engineer for construction equipment has been announced by the Blaw-Knox Co. Assigned to the Birmingham district office, he will cover the states of Texas, Oklahoma, and New Mexico. His headquarters will be located in Dallas.

Lima Names Calif. Dealer

Thompson Sage, Inc., Stockton, Calif., has been named an authorized agent for the complete line of shovels, cranes, and draglines made by the Lima Shovel & Crane Division of the Lima-Hamilton Corp. Located at 400 So. Wilson Way, the Sage company will cover the territory surrounding Stockton.

THE NAVY KNOWS HAMMERS

McKiernan-Terry Double-Acting Pile Hammer driving timber piles for the foundation of a U. S. Navy depot shop in Alaska.

On pre-war, wartime and post-war construction projects of the U. S. Navy, McKiernan-Terry Pile Hammers have been a frequent choice. During the war they were used in practically every theatre of operations. For Navy engineers, like contractors on civilian construction, make their choice of equipment on a basis of performance. In selecting McKiernan-Terry Hammers they expect and get powerful, dependable, safe operation.

There is a right McKiernan-Terry Pile Hammer for any specific type of job. Double-Acting Hammers in ten standard sizes; Single-Acting Hammers in five; Double-Acting Extractors in two.

FREE DESCRIPTIVE BULLETINS

Write for Bulletins No. 55 and No. 57 giving full information on McKiernan-Terry Double-Acting and Single-Acting Pile Hammers.



McKiernan-Terry Double-Acting Hammer driving timber piles to strengthen a pier at the U. S. Navy Submarine Base, New London, Conn.

McKiernan-Terry
CORPORATION

Manufacturing Engineers
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